JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

Rejected!

THE House of Lords have righted the wrong which the Police and Sanitary Committee of the House of Commons committed in the matter of the proposed expropriation of the East Hull Gas Company's property by the Corporation; and the manner in which the Earl of Donoughmore's Committee did the just thing lends piquancy to their decision. They gave a rebuff which, by its sharpness on the case alone of the Corporation for compulsory sale, was eloquent of their appreciation of the inherent weaknesses of that case, and of the dearth of justification that it presented. Furthermore, their Lordships were true to the traditional practice of their House, to defend statutorily controlled private enterprise against marauding municipalizers, without there being a clear case of wilful default or transparent proof of public advantage. Neither the one nor the other could be shown in this instance. Indeed, the Corporation case had a miserable foundation for the heavy superstructure reared by their professional witnesses, the members of which superstructure were drawn principally from the Board of Trade returns and from the experience of what others had done under different circumstances through the acquisition mostly by agreement or by the transfer of non-statutory undertakings in days different from the present, and when gas was a monopoly of a complexion totally distinct from what it is to-day. The ancient and the modern are in disagreement, and the disagreement is the outcome of present-day municipal policy, which seeks to bring under one dominion all public enterprises, competing or otherwise; and that is a policy that is not, we maintain with deliberation, in the best interests of the public.

It is a reflection upon the acumen of the Police and Sanitary Committee of the House of Commons, or else a corroboration of our previously expressed opinion that with the Committee "any excuse was better than none" for setting aside justice and giving support to a case for municipalization, that the Earl of Donoughmore's Committee did not require to hear the Company's evidence, which Mr. Corrie Grant's Committee said, if they did not think, was so essential; and this confirms Mr. Balfour Browne's view, when before the Committee of the other House, that there was no case to answer, and therefore no necessity for calling any expert evidence. Professedly, the Commons Committee accounted it (for it suited their purpose) an act of pusillanimity on the part of Mr. Balfour Browne in not tendering evidence to rebut the alleged petty acts of misdemeanour on the part of the Company; the House of Lords were satisfied, without hearing the evidence proffered by the Company on this occasion—and proffered only to avoid false assumption—with the opulent testimony to a hollow and laboured case that Counsel and witnesses for the Corporation submitted, with naturally the best of intention to do something to justify the confidence of the Corporation in them. That they failed is not their fault; they cannot make sound bricks any more than anyone else can without the proper means.

Most of the witnesses, manifestly feeling the weakness of their case, tried the effect of impressing the Committee with the view that the proprietors of the gas undertaking would not suffer, as the Corporation—magnanimity incarnate—were perfectly willing to pay them a "fair" price. The notions of the Corporation as to what is right and fair in the matter of recompense under the circumstances have been brought rather boldly and forcibly within the range of vision by their repeated endeavours to knock on the head, in this instance, the percentage allowance awarded in compulsory sales in the case of arbitrations under the Lands Clauses Acts. The Lords Committee also had dangled before them the fact that the average capital expenditure, per million cubic feet of gas sold, of gas undertakings in the possession of local authorities is lower than that of the average of gas companies. But the difference was minimized by a statement that this was partly accountable to stock conversion. There can be no use in presenting such figures, unless the intention is that a Committee should draw the inference that local authorities are more provident than companies in the matter of capital expenditure. Is it fair to make use of these figures without an explanation of all the other circumstances that go to swell the average capital expenditure of gas companies in comparison with local authorities? We say that it is not. It is suggested by Mr. Charles Hunt that, as local authorities have usually had to pay large sums for goodwill, the comparison holds good—that is to say, the amount paid for goodwill is a fair set-off to the inflation of the companies' average produced by the conversion of capital. To prove its correctness, we want something more than the bare iteration of this in Parliamentary Committee-rooms and elsewhere. The transfers of the large gas undertakings to local authorities were made many years ago, before the businesses were of anything like the magnitude they are now; and the amount paid for goodwill was insignificant compared with what it would be to-day. Assuming the statement to be correct, do goodwill and conversion embrace all the considerations that make comparison fair? These are matters that are not beside the main question, seeing that they were used as make-weight in the case of the Hull Corporation. There was one other point, too. Was it a slip of the tongue, or an intentional act, that the Hon. J. D. Fitzgerald should have described to the Committee the "suspensory" clause inserted in the Company's Act of 1906 as a "purchase" clause? The description might have all the difference in its influence. However, the two suspensory clauses in Gas Bills of 1906 have been for some people a snare and a delusion, and that has been the sum-total of their effect.

The details of the evidence laid by the Corporation before the Lords Committee were much the same as those upon which we commented when the Bill was before the Police and Sanitary Committee of the Commons. It was not strengthened in any way; and therefore we will not waste time and space in further criticism. But we will merely say, in conclusion, that the victory of the East Hull Gas Company has been complete; and the Board of the Company and their advisers in this matter merit the warmest thanks of all engaged in statutorily-controlled private gas enterprise in the kingdom. The Company's legal representatives throughout were Mr. Balfour Browne, K.C., Mr. Honoratus Lloyd, K.C., and Mr. A. M. Paddon; and the expert advisers were Messrs. Corbet Woodall and Son and Messrs. W. A. Valon and Son, with the Company's own energetic Engineer, Mr. J. Holliday. Their firmness and tenacity, supported by a united Board of Directors, has had a result of far-reaching importance to statutory gas companies; and we congratulate them. Of this we are quite sure, that not only have they by their work given a new lease of life to the East Hull Gas Company, but they have put a spoke into the municipalistic wheel, the revolutions of which, under the propelling force of present-day socialistic agencies, bode no good for the future of this country. Anyway, for Hull we should imagine that the question of further gas-works purchase is dead for some years, unless the Corporation can summon up courage sufficient to follow the opinion of Alderman Larard that the whole gas supply of Hull should be under municipal control, and promote a Bill to acquire the British Gaslight Company as well as the East Hull Company. The order is a big one; and we think the Corporation, before they venture to deal with it—if ever they consider the attempt worth the making—will desire to live down the memory of the impression they made this session in the House of Lords, that no public purpose would be served by the transfer to them of the East Hull Gas Company. The petty charges they preferred against the Company of peccancy in financial conduct were eclipsed by the

trenchant examination into their own financial doings and indifferent success in connection with certain of their trading departments; and they have yet to clean their own slate, to reverse the order of things existing in Hull—viz., that the cheapest gas is furnished by Companies, and not by the Corporation—to produce proof that they can do better than the Companies, and to show that the latter have really abused their privileges, before anyway the House of Lords (the present municipal-ridden House of Commons can well be left out of the question) will consent to violate the security and protection they have themselves created and dispensed.

The Defensive Power of Low-Priced Gas.

THERE are many people who tell us that the price of gas is, generally speaking, at a sufficiently low level, with the incandescent system at command, for illuminating purposes. While admitting the truth of this, we are reminded by others that a considerable percentage of gas is used for cooking, heating, and power purposes, and that a price for gas that is low for illuminating use may be high for these branches of business, and therefore not conducive to their greatest development. This being so, unless a reasonable all-round price can be attained to compass the requirements of all classes of business, we are brought face to face with the necessity for differential prices, if business is not to be allowed to stagnate, and competitors be given entry at an unguarded door. The gospel of prudent low prices has always been preached in these columns; and their potency in these times, in retarding the progress of competitors, has received some notable illustrations. Private and street electric lighting have, in the places in mind, moved forward sluggishly, and suction gas plant has not made headway, with its inherent frailties and inconsistencies and deficiencies in brake horse power in comparison with town's gas.

Those readers who perused the short report in our "Miscellaneous News" last week, headed "Gas and Electricity at Sheffield," will have remarked that the low-priced gas in that city is viewed with joyless interest by the Corporation Electricity Department. Every gas-supplying company or authority cannot expect to reach the heights on the pinnacle of low prices attained by Widnes, Sheffield, Plymouth, and certain other places; and unfortunately high coal prices have come upon the industry to hinder those whose policy is the lowest possible price with good returns from the maintained and extended volume of business. But what was said at Sheffield, during the meeting there of the Incorporated Municipal Electrical Association, by the Lord Mayor (Alderman R. Styring), Sir William Clegg, and others will serve as a stimulus in the gas industry, by the illustration given of the value of low prices in meeting the competition of electricity. The Lord Mayor is not of those who regard the act of the Gas Company in standing in the way of the progress of the municipal electricity supply as almost Machiavelian in character, and who would doubtless like to see the Company's undertaking transferred to the Corporation—not for the purpose of benefiting the citizens, but with the object of so administering the concern that its impregnable position in relation to electricity should be broken down. The citizens would find something amiss with the philosophy of such advocates if the suggestion were ever seriously submitted in the Council Chamber. A greater acknowledgment of the strength of the Gas Company could not have been made, nor a greater compliment paid to the sagacious management of Directors and officials, than what has been described as the pathetic confession of the Lord Mayor that the Corporation electricity undertaking is singularly handicapped, and is carried on under most trying conditions—"singular handicapping" and "trying conditions" being concentrated in low gas prices. If the members of the Association did not realize it before, they did by the time his Lordship finished his remarks on the subject, that the low price of gas is "a factor of the greatest importance "to the Corporation in carrying on their electricity undertaking," and that it subjects those engaged in conducting the latter to "a severe strain."

However, his Lordship protested that he did not complain of the cheapness of gas, as the citizens reaped the benefit. But the subject took such a firm hold during the meeting, that it turned up again at the dinner, when Sir William Clegg observed that "some of them would have to seriously "consider what was the wisest course to follow in regard to "the Gas Company in the future. . . . It might be "desirable to open negotiations with them with the object "of purchasing the concern." The idea is a droll one, and worthy an after-dinner speech. If earnestly made—and Sir William has since assured the readers of the local papers that it was—the citizens would consider well the purpose and consequence of such a proceeding before they gave their sanction to it. The only interests such a transfer of management could possibly serve would be those of the Electricity Department. The two undertakings coming under one management, competition would practically cease, gas and electricity prices to consumers could be ordered as the municipal monopolists willed, and the price of gas could be put to such a figure to the detriment of the consumers that it would no longer possess the power that it has in the present of forming a barrier past which increments of electrical business can only slowly trickle. Under municipal management, the private and manufacturing consumers would lose the safeguard that they have in the maintenance of competitive management and enterprise. Cheap gas has a strong place in their affections; and it is private enterprise that has given it to them. With that private enterprise they are very well content; and Sir William Clegg must look elsewhere than to municipal ownership of the gas undertaking for a solution of the difficulties under which the municipal electricity undertaking in Sheffield laboriously moves. Moreover, Sir William is sage enough to see that there would be no use going to Parliament with a "public "policy" case for compulsory purchase; and so any transfer would have to be with the Gas Company as willing sellers. The day when they will be that is certainly not yet.

A Curious Judicial Award.

NEVER before, we believe, can so unique a point have been submitted to a legal tribunal as that which was recently placed before an Arbitration Court at Rome in a dispute between the Municipality of Messina, in Sicily, and the Continental Union Gas Company, Limited. The town authorities sought to profit by a clause in the contract with the Gas Company which (though we have not the actual wording of it before us) in effect seems to have specified that, should scientific progress lead to economies in the manufacture of coal gas, the public and private consumers of Messina should benefit thereby. Bearing in mind the date of the agreement between the two parties (the year 1861), and also the state of Italy at that time—still unconsolidated and backward in trade and development—such a clause hardly appears unreasonable when handing over to a foreign and monopolistic Company the public and private illumination of an important port and town. Forty-five years later, when the Messina Municipality owed the Gas Company a sum of about £25,000 for the public lighting, the Town lodged a claim for a share in various profits and economies alleged to have been made in gas manufacture. The claim was submitted to arbitration, and the decision is set out in the June issue of our Italian contemporary "Il Gaz;" a summarized translation of the award being given in our "Legal Intelligence." The *Collegio Arbitrale*, or Arbitration Court, declares that there are three processes of gas manufacture which constitute scientific progress from (we suppose) what was in vogue in the Messina Gas-Works in the year 1861. These three are, firstly (and surprisingly), mechanical exhausters; secondly, "the new process of puri-"fication" (whatever that may mean); and, thirdly, "pro-"ducers built for the carbonization of coal," by which we understand must be meant regenerative furnaces.

As regards the first point, we are convinced that gas exhausters must have been in use, even in Messina, in 1861; for, apart from pump exhausters, Beale's rotary exhauster dates from 1848. The new purification process we can only suppose is some form of rotary washer-scrubber. But, not content with determining these "scientific" improvements, the Court proceeds to allocate to each the economy it has produced. The lion's share is given to the exhauster, which accounts for 0·96 c. per cubic metre of gas, or approximately 2½d. per 1000 cubic feet. The purification process is valued at 0·19 c. per cubic metre, or less than ½d. per 1000 cubic feet; while the regenerative furnace has economized 0·85 c. per cubic metre, or some 2¼d. per 1000 cubic feet. It would certainly be interesting to have detailed figures of these results of such new and economical processes. Were these prices, however arrived at, to be multiplied by all the cubic metres of gas made since the introduction of the so-called novelties, the result might be serious to the Continental Union Gas Company. But the Arbitration Court condemns the

Company to pay only on the gas made since Jan. 29, 1906—the date of the arbitration proceedings; so that the damage apparently only amounts to a matter of about £500. It seems, however, to carry with it a definite reduction of 1 c. per cubic metre in the price of gas both for public and private lighting. As, however, the Company have only to pay one-third of the costs of the actual arbitration proceedings, and as other demands of the Municipality have been rejected, the total result appears to be in favour of the Company and against the Municipality. The persons who profit mostly, it seems, are the three Arbitrators, who are to divide equally the sum of £720; and we suppose the Municipality of Messina are still left with a larger load of liability to pay off. Altogether, a somewhat curious arbitration.

Testing Electricity.

WHY all this bother? The Metropolitan Borough Councils who supply electricity are surely needlessly alarming themselves over a simple proposition of the London County Council—at least we will do them the credit for the moment of thinking so, though we must, of course, admit that they know best. The County Council are proposing to establish a number of stations for testing the pressure at which electrical current is being supplied to consumers. The Law and Parliamentary Committee of the Fulham Borough Council avow that the cost of providing these testing-stations would be something enormous; and Bermondsey, Battersea, Hackney, and may be several other Councils, are also protesting against what they term the needless expenditure for this purpose. In a measure, we sympathize with the electrical distributors; but we do want to know why they should be allowed to go scot-free while gas suppliers have had for many a long year to wear the bridle manufactured by the joint exertions of Parliament, the Spring Gardens Authority, and the Metropolitan Gas Referees. Our electrical friends are perhaps not sufficiently instructed in Metropolitan Gas Affairs to know that there are no less than 22 stations in London at which gas is, by the most refined means available, tested for illuminating power (by both the standard and a flat-flame burner), for purity, and for calorific power; and the gas examiners have authority to indulge in peripatetic exercise in making examinations for pressure at public street-lamps. Save for calorific power and illuminating power by the flat-flame burners, penalties attach to lapses under prescribed conditions. We have strong views as to the uselessness of all this testing in these days when competition protects the public, and any backsliding brings, through the production of discontent, its own injury upon the supplier. But, at the same time, we are not favourably disposed to inequality of laws, and therefore fail to see why gas suppliers should be so watched and pryed upon under the delusion that it is necessary in the interests of the public, while electricity suppliers have fully uncontrolled liberty. It is well known that voltages have an unhappy way of varying considerably, and that consequently the consumers suffer. Unquestionably that is why, and not the expense of the testing-stations, the proposal of the County Council is regarded with such displeasure. The expense is a lame excuse. As to cost, the three London Gas Companies have had to bear the expense of the twenty-two stations at which gas testing is performed; so that the electricity suppliers have not much at which to grumble. When the President of the Board of Trade remembers what is done in the matter of testing in the case of gas supply, he is likely to treat lightly the protest of the electricity suppliers, and especially the ground upon which the protest is made.

Unaccounted-for Gas and Consumers' Meters.

The communication on this subject by Mr. Norton H. Humphrys, which appears in another column, amounts to a strong indictment of the Sales of Gas Act. The author considers that its connection with the item of unaccounted-for gas has not been sufficiently regarded, and addresses himself to the task of showing that, in practice, there is a great difference—and that to the disadvantage of the seller—between a meter that registers a fixed percentage slow, and one that passes even a small percentage unregistered. The loss from the last-named cause is the more unsatisfactory because it is uncertain and indefinite. He shows that the small percentage of unregistered gas may, in practice, amount to as much as 33 per cent. of the total quantity registered; and he suggests that any future amendment of the Sales of Gas Act should include stringent regulations in respect to unregistered gas, and also that since the meter has an inherent tendency to tell against the seller, there is no reason why the buyer should receive the advantage of the turn of the scale.

Electric Street-Lamp Returns.

In the report of the Council of the Incorporated Municipal Electrical Association, we read that, in order to provide data to "controvert the statement so often brought forward by those interested in the supply of gas for public lighting," to the effect that electric lamps are not suitable for street lighting, the Council have issued a schedule of questions to every "municipal electrical engineer" with a view to publishing periodically a progress sheet showing the number of gas-lamps displaced by electric lamps. The returns are not yet complete; and the final result of the Council's action is to be subsequently published in the Association's "Proceedings." We may be excused for wondering how returns as to the number of street electric lamps in places supplied with electricity by municipalities will "controvert" the statement that electric lamps are not the most suitable for street lighting. What the returns will demonstrate is the interest in street electric lighting of local authorities who are under an obligation to produce as good a balance-sheet as possible for an electricity undertaking—no matter out of whose pocket the revenue is derived. It would be a matter for regret if the Council were to take amiss two or three suggestions which we submit, in order to make the returns as perfect as possible. It would be instructive if the returns were made retrospective, so as to show the progress (say) during the last two quinquennial periods. It would also be interesting if the returns included towns where the electricity supply is not under the management of the local authorities. It is hoped, too, that the returns will discriminate between flame and ordinary arc lighting, Nernst, Tantalum, other metallic filament lamps, and carbon filament lamps. Also that the prices paid per lamp—including all expenditure—will be given, as well as the mileage of road lighted, with the comparative figures for incandescent gas lighting. Such returns should have a comprehensive usefulness. We further trust that it may be within the region of practicability not only to enter the returns in the Association's "Proceedings," but to give the returns the greatest possible publicity, so as to enhance their value. Anyway, if a copy is addressed to the "JOURNAL" office, it will be gratefully received. Always willing to give reasonable help in good work, the Council will no doubt like to make a brief announcement in the returns to this effect: In the year when the first Electric Lighting Act was passed (1882), the number of public lamps supplied by statutory gas undertakings in the United Kingdom was 361,311; in 1905-6 (the year covered by the last Board of Trade returns), the number of public lamps supplied by statutory gas undertakings was 665,791.

In Support of Private Enterprise.

Considering all the circumstances of the case, it was no more than natural that there should have been, at the annual meeting of the Industrial Freedom League last week, a good deal of satisfaction expressed with regard to the results of the recent County Council elections in the Metropolis. For the gratifying change that then occurred in the constitution of the Council, the speakers at the meeting claimed some credit as being due to the League; and there does not seem any real justification for questioning the accuracy of this contention. For some years past the League have incessantly occupied themselves in placing before the public their very pronounced views on the subject of municipal incursions into the realms of speculative trading; and though there has no doubt been a certain amount of reiteration of their arguments, it must be urged in excuse—if, indeed, any excuse be needed—that a great deal of repetition is generally necessary before any substantial impression can be made upon the public mind. It may well be that in the opinion of some people the League have gone to the other extreme in their arguments against municipal trading. But these are days of extremes; and the answer to any such criticism would no doubt be that it was necessary to point to every conceivable eventuality in order to fully rouse the popular mind to a sense of the danger which lies ahead. Be this as it may, however, there is clearly one thing that must be at once admitted by everyone—and this is that both the present President of the League,

Sir Felix Schuster, Bart., and his predecessor, Lord Avebury, are men whose intimate knowledge of money matters is such as to entitle their opinions, at any rate on the financial aspect of the question, to the greatest possible respect. In our "Miscellaneous News" columns to-day, there will be found an account of that portion of the proceedings which related more particularly to branches of the subject in which readers of the "JOURNAL" are specially interested; and from this it will be seen that gas, water, and electricity all came in for some share of attention. The Metropolitan Water Board was cited as a case in which there has been a distinct—and unwelcome—difference between "expectation" and "realization;" it being pointed out that, so far from the public having gained in the shape of "profits," there is a scheme on foot to raise the charges for water, while at the same time they have lost the safeguard which they formerly possessed in the vigilant watching of the Water Companies by the Local Authority. As regards gas, the recently mooted acquisition of the Sheffield undertaking by the Corporation was criticized; and it was prophesied that in the event of purchase, the consumers would have to face considerably higher prices for gas, before there were any profits realized for allocation to the relief of the rates. It was further pointed out that the electricity consumers would likewise suffer by having to pay more for their current in consequence of the withdrawal of the severe competition of cheap gas to which the municipally owned electrical undertaking is now subjected. As to London, Lord Avebury gave it as his opinion that the throwing out of the Electricity Bill of the present County Council meant that people would have to pay higher rates than they need for an electricity supply, because the present House of Commons would not, if they could help it, allow anything to be done by private enterprise.

Corporation Gas Undertakings.

A further batch of results of the past year's working of Corporation gas undertakings is noticed to-day; and from the points that are to be gathered from them, the few following may be mentioned. At Coventry, a very gratifying increase in the quantity of gas sold has been experienced—51 million cubic feet, or 7·23 per cent., over the previous year—and for this, of course, thanks are due to the industrial prosperity of the city. The average price of gas is now lower than it has ever been since the Corporation acquired the undertaking—namely, 2s. 2·21d. per 1000 cubic feet. The price of gas for manufacturing purposes is 1s. 9d.; and it is stated that by this reduction all the large consumers have been retained, and no one is to-day thinking of putting down a gas-producer plant. The district fund is to receive £2000. The sale of gas at Darlington has gone up from about 311 million cubic feet to 325 millions, and the gross profit from £11,851 to £13,480. The sum of £4000 has been transferred to the district fund in aid of the rates. The annual report at Hereford is the first one presented by the new Engineer, Mr. W. W. Townsend, whose efforts are much appreciated by the Gas Committee. Though there was an increase in the consumption of gas, the gross profit is about £350 less than was the case in the preceding year, owing to a reduction in price having extended over the full period instead of only nine months. With a bigger sale by 123,000 cubic feet, the quantity of coal carbonized was reduced 300 tons; in other words, the make of gas per ton was 11,026 cubic feet, as compared with 10,909 cubic feet in the previous twelve months. At the same time, the unaccounted-for gas was reduced from 8·56 per cent. to 7·9 per cent. The increase in profit at Longton over that of the preceding year is £659; and £2500 has been handed over to the borough fund. The "Staffordshire Sentinel" remarks that Longton enjoys the advantage of having both the gas and electricity concerns under one management. It certainly seems clear that the latter, at any rate, gains substantially from the partnership. We are told that "the gas-works have further relieved the rates by materially assisting the electricity department. All deficits hitherto incurred in the development of the undertaking have been defrayed by the gas-works; otherwise they would have fallen upon the rates or remained as a deadweight, to be liquidated later on." The gas-works capital account at Longton is being steadily reduced; interest and sinking fund charges, which amounted to 1s. per 1000 cubic feet of gas sold, having now been brought down to 10½d.

NOTES FROM WESTMINSTER.

DIRECTLY it is seen that Private Bills are receiving the Royal Assent, then we know the beginning of the end of the session's work in which there is concern for us has arrived. Several Bills have now completed their parliamentary journey, and have reached the dignity of Acts. Among them are to be found the Removal of Sulphur Restrictions Bill; and Bills promoted by the Mitcham and Wimbledon, Maidstone, Falmouth, Basingstoke, Shanklin, Grays and Tilbury, Brockenhurst, and Boston Spa Gas Companies. On Thursday the proceedings on the Hull Bill commenced, and were completed on Friday, with the result that we expected from the House of Lords. Water measures also had a fair innings during the week.

Overthrow of the Hull Purchase Scheme. The representatives of the East Hull Gas Company left the presence of the House of Lords Committee over which the Earl of Donoughmore presided with their title to continued possession of their undertaking completely ratified; and they may now fully enjoy and use, in the interests of the undertaking and the consumers, the powers which Parliament gave them last year, but which were placed provisionally under suspension. The gas section of the Bill only occupied part of Thursday's and Friday's sittings; and during that time all the Committee heard, in addition to an impassioned and eloquent address by Mr. Balfour Browne on behalf of the East Hull Gas Company and of statutory private enterprise generally, was the case of the Corporation for purchase. That case killed the gas section of the Bill, as it would have done before any unbiassed tribunal. It was the same case that we heard some three months ago. A Company supplying gas at a lower rate than the 2s. 6d. charged by the Corporation in another part of Hull—that is to say, at the present time at 2s., formerly at 2s. 4d., reduction to which was from 2s. 6d. (at which price the Company had been supplying from the year 1900) —was charged with want of consideration to the inhabitants in their district, with doing wrong in exercising some time ago their legal power to distribute new issues of capital among the shareholders at par, and with having an unconscionably large leakage account. These petty charges were answered in the Commons. Their discovery only dates from the time the Corporation promoted their Purchase Bill; for in 1906 there was honest and good speaking in the Committee-rooms on the part of the Corporation as to the management of the Company. Whether the Company will be able to maintain the 2s. price, of course, depends on the altered condition of the coal market; but a 2s. 4d. price cannot be called unreasonable in view of the Corporation's 2s. 6d. As to the former distribution of capital at par among the shareholders under the authority of Parliament, that act is only one side of the question. The expenditure of the capital is also of importance; and that in this Company it has been well expended is shown by the price charged for gas, and also by Mr. E. H. Stevenson's testimony for the Corporation as to the excellent condition of the plant when working up the Police and Sanitary Committee to a benevolent frame of mind regarding the period for the repayment of the purchase loan which will not now be required. Regarding leakage, too, on the same occasion, Mr. Stevenson considered that "the mains were in good order, judging by the unaccounted for gas." In all respects the answers to the allegations made have been provided by the Corporation's own case and witnesses. On Thursday and Friday there was much talking round about these matters; but nothing new could be discovered in the speech of the Hon. J. D. Fitzgerald, K.C. (with whom were Mr. Ram, K.C., and Mr. Jeeves), or in the evidence of Mr. F. J. Bancroft, Mr. E. H. Stevenson, or Mr. Charles Hunt. Mr. William Cash, F.C.A., was also on the same side. All points were exhausted in the House of Commons. The estimation by the Lords Committee of the case was such that they absolutely ignored the presence (after Mr. Balfour Browne's opening for the Company) in the witness chair of the Company's Engineer (Mr. J. Holliday); and, without asking for the room to be cleared, they conferred round the table, and announced that they were not prepared to proceed with this section of the Bill. And in these half-a-dozen words they deprived all in waiting of the interest that would have been gained from the evidence of Mr. Corbet Woodall, Mr. Arthur Valon, and Mr. Holliday. But the Committee had heard enough; and the win of the Company and the confusion of the Corporation were, in consequence, greater than if the case of the Company had been followed to the end. However, the important point in these proceedings is that the House of Lords will not have forced sales without full and fair reason; and only on such a line of action can justice to existing interests and past legislation be done. With Mr. Balfour Browne for the Company were Mr. Honoratus Lloyd, K.C., and Mr. A. M. Paddon.

Annfield Plain Gas Bill. With reference to the note on this Bill in last week's issue, it has been suggested to us that an explanation should be made, in order that the injustice should not be done to Messrs. Schultz and Comins of causing readers to suspect that they have, in the proceedings on this measure, been contending for anything more than the fair value of the property to the Company (in which they will be financially interested as shareholders to a substantial extent), or for anything more than the money that they have actually expended. Reference to the verbatim report of the proceedings enables this now to be done. But before alluding to this special

matter, we would have it perfectly understood—our previous remarks have, we hope, made this abundantly clear—that the position of the firm and their honourable connection with the gas industry detaches them completely from the company-promoting coteries that have made the gas industry of late the seat of certain disgraceful operations. The success of the Annfield Plain Bill, despite the character of the opposition in both Houses, carries its own weight of testimony for those who were engaged in the promotion of it.

The main point, however, to which attention is directed relates to the remark of last week that, subsequent to the printing of the Bill as originally deposited, the promoters introduced a clause which would have considerably curbed the arbitrator when determining the price the Gas Company were to pay the vendors for the property and the works executed by them. The clause to which reference was being made has never, however, been incorporated in the printed Bill; and it never got farther than a manuscript condition and a mere suggestion. Part of the terms of the clause were as follows: "Provided further that the purchase price when settled by the said arbitrator shall be paid and satisfied as to the sum of £10,000 by the issue by the Company to the owners of the original capital in the Company, and as to the balance in cash, or, at the option of the Company, by the issue by the Company to the owners of fully-paid ordinary or preference shares, at the option of the Company, in the additional capital," and so on.

Well, it may be remembered the contention of the opposition to the Bill was that the works and property were not worth what Messrs. Schultz and Comins had given for them, and that this clause was clearly a direction to the arbitrator to award them something more than £10,000, and that the £10,000 was intended —anyway at first—to be in original 10 per cent. capital. But right in the opening speech of Mr. Honoratus Lloyd, K.C., when the Bill was before the House of Commons Committee, we find that the promoters had, on his advice, relinquished the idea of original capital, and asked that the whole of the capital should be 7 per cent.; and in his closing speech before the Commons Committee, learned Counsel voluntarily and definitely renounced all parts of the proviso—including the £10,000—that were considered to be a direction to the arbitrator. It will be seen from this that Messrs. Schultz and Comins—while in the first place, by the framing of the manuscript clause, they gave an indication of the minimum sum to which they considered they were entitled—were not persistent even to the point of getting a decision from the Committee on the subject, but only desired a fair award. However, the proviso inserted by the Lords Committee, though it does not mention any specific sum, virtually gives the vendors all that they were asking in the manuscript clause, inasmuch as the purchase price is now ordained to be the total of the actual sums paid by the owners for the lands, gas-works, and property, with actual costs and out-of-pocket expenses, and the fair value of all works executed by them since the acquisition—the purchase price to be settled by a single arbitrator.

The Purity of the Bure. The Great Yarmouth and Lowestoft Water Bill is still in the balance. A large amount of contradictory evidence has been given, before Sir Joseph Leese's Committee, as to the suitability or otherwise of the River Bure as a source of supply. The evidence has been completed; and Mr. Balfour Browne is to be heard to-day on behalf of the two promoting Companies. The Companies have fought so long and strenuously for their joint scheme, and the Great Yarmouth Corporation are apparently equally persuaded that they have right on their side in preventing the Companies taking this water, that the Committee (though the scheme has satisfied the House of Lords) are, it seems, determined to give it their fullest consideration. When they have announced their decision will be time enough to make further reference to the proceedings.

Birmingham Water for Coventry. The Coventry Corporation have finally carried their Water Bill through Committee, albeit stiff little contests in both Houses. The North Warwickshire Water Company met the Corporation before Major Seeley's Committee last week; their contention being that the Corporation are going to spend a lot of money in laying a pipe to take water from the old Shustoke reservoir of the Birmingham Corporation (which water Birmingham do not want now that they have their Welsh supply), that the water is of questionable quality, and that the Company are themselves prepared to supply them more cheaply and efficiently with a pure supply. The minimum price Coventry is to pay Birmingham for the accommodation is £5000 a year (the rate being 4d. per 1000 gallons); and there is a proviso that should the water at any time become impure, Birmingham will supply Coventry with Welsh water. This is important when one considers the statement of Sir Alexander Binnie in the course of his evidence that the water proposed to be used by Coventry is "ten thousand times" more polluted than the Thames. The issue of the proceedings was indicated well before they ended by a laconic expression of the Chairman's opinion that the opposition was of "a flimsy character." That the water is not so bad as it was painted was well proved by the technical evidence advanced both from Birmingham and Coventry. The only conditions affixed to the passing of the Bill were that certain suggestions by the Local Government Board should be carried out, and that outside areas should not be charged less than the rate in Coventry.

Unhappy Conditions. The Heywood and Middleton Water Board have been unfortunate. They are building an extensive new reservoir which will greatly enlarge their resources; but, through faults in the strata, they have had to carry the foundations down some 50 or 60 feet lower than was anticipated. Capital expenditure has, in consequence, been enormously and unavoidably increased. The Board have apparently had a run of bad luck; for it is alleged that the water-rates in Heywood and Middleton are the highest in the country. Any other town wishing to lay claim to this unenviable distinction may like to know that the Unopposed Bills Committee of the Commons were last week informed that in Heywood the water-rates range from 10 to 7½ per cent. upon the gross rental, and in Middleton from 12½ to 10 per cent. The provision of the water supply therefore presses heavily on the people of those towns; and unfortunately further borrowing powers—the principal object of the Board's present Bill—are required for the reservoir in hand. We can hardly see the reason for the Unopposed Bills Committee inserting a clause in the Bill to the effect that the Board shall not sink any wells or intercept any water otherwise than by works expressly authorized by Parliament or by any statutory provision. It is, however, a harmless kind of thing, as it is hardly likely the Board would exceed their powers in this respect.

Scotch Water Waste. The Renfrewshire County Council and the Glasgow Corporation and others are in opposition before Major Seeley's Committee over a scheme which the former are promoting, whereby they propose to purchase the undertaking of the Busby Water Company (who are willing sellers) and to construct reservoirs at Bennan Loch and Loch Craig for the upper district of the county. The Glasgow Corporation had a rival scheme, which was rejected by the House of Lords; and so they are before the Committee of the Commons as opponents of the Renfrewshire Council. It is hinted that, at the back of the Glasgow Corporation's opposition, is a fear that the passing of the Bill may weaken their case for annexation. On the new works, the County Council propose to spend £46,500. The evidence has been largely directed to showing that Glasgow cannot—but they deny the allegation—supply from their existing works the higher levels of the district in question; while the promoters of the measure affirm that their scheme will do all that is necessary. In the Busby Water Company's district, the waste of water has been going on at an alarming rate; and certainly there is room for the people mending their ways in this connection. To this the County Council want an opportunity for giving some attention. On the occasion of one measurement by Sir W. R. Copeland, the consumption of water was proceeding at the rate of 70 gallons per head per day; and Mr. James Watson has made the interesting calculation that 71 gallons a day for each inhabitant in a house containing a family of five, means that every day 1½ tons of water are being pumped into the house. This totals to several hundred tons a year. According to our Scotch Correspondent, an agreement has been come to between the promoters and the Glasgow Corporation. The proceedings are going to be continued to-morrow.

PERSONAL.

Mr. Baldwin Frankland, Chief Assistant to the Water Engineer of the Leeds Corporation (Mr. C. G. Henzell, M.Inst.C.E.), has accepted the position of Manager of the Weymouth Water-Works.

In response to the invitation contained in the "Journal" for the 18th ult., no less than 190 applications were sent in for the position of Manager and Assistant-Secretary of the Banbury Gas Company; and out of them Mr. J. R. Duff, of Morecambe, has been appointed.

At the meeting of the Stockport Town Council last Wednesday, the Gas Committee reported that they had selected, out of 196 candidates, Mr. William Blundell, of Southport, to fill the position of Chief Clerk to the Gas Department, in succession to Mr. T. Bedford.

Yesterday (Monday) week a meeting of the employees of the Nine Elms works of the Gaslight and Coke Company was held to wish Mr. Frederick Beale good-bye, and to present him with a token of their regard and esteem. The presentation was made by Mr. Wilton, his assistant, who, in a very able speech, expressed the feelings of the meeting. In reply, Mr. Beale thanked all present for their kind wishes for his welfare. The gift was a very handsome silver rose bowl, suitably inscribed.

After a very considerable tenure of the office of Chairman of the Brentford Gas Company, Mr. Howard Charles Ward has surrendered it to one of his younger colleagues—Mr. Ulick J. Burke. Mr. Ward, however, is not severing his connection with the administration. His services for the Company have been so long and distinguished, that his colleagues would regret to be denied his counsel and experience while health permits. The vacancy on the Board occasioned by the death of Mr. Frank Morris has been filled by the election of Mr. William King, of Liverpool. The Board have done wisely in continuing technical representation.

The death occurred on the 3rd inst., in his 60th year, of Heer Dirk van der Horst, of the Amsterdam Gas-Works.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 124.)

THE course of things on the Stock Exchange last week was not absolutely unchequered. The arrest of improvement was but brief, however, and afterwards the general recovery which we were able to note in our last issue proceeded to solidify itself. Business is not yet booming; but it is getting steadily brisker and more active. The opening day last week was very quiet; but from the start the tone was encouraging. There was evidence of a fair amount of investment purchasing, and prices in many lines were rising. But on Tuesday the advance sustained a check. One or two queer rumours were set rolling; and, as the markets had not quite thrown off their old sensitiveness, a relapse ensued. Consols fell ¼ on sales. The depression prevailed on Wednesday, aided by the dismal weather, which was bad for railway traffics, and Consols fell another ⅛. Next day, however, the better tone recovered itself, and cheerfulness reigned once more. Buyers came in to the support of markets, and prices rose again. This happier state of things prevailed on Friday and Saturday. Business became more active, the improvement in the weather helped railways, and generally in pretty well every department there was a nice tone that endured up to the close. In the Money Market, the turn of the half year made money very easy at first. But as the week progressed, the demand became stronger; and rates were firmer and closed steady. Business in the Gas Market was a fair average in the aggregate, but was irregularly distributed through the week; some days being a great deal more active than others. The market participated in the cheerful tone which prevailed generally; and a good many important issues improved in price. In Gaslight and Coke, the ordinary was brisk and strong. Opening on Monday at 94¼, it steadily advanced to 96, at which figure several parcels of stock changed hands—a rise of 1 in quotation. The secured issues were not much noticed, and were unchanged. The maximum marked 88½ and 90, the preference 104 and 105, and the debenture from 83½ to 84. South Metropolitan was less active, but improved in strength; the quotation rising 1½, with dealings at from 119 to 120½. The debenture was a point lower, at from 82 to 83½. Nothing at all was marked in Commercials. In the Suburban and Provincial group, Alliance and Dublin was done at 20½ and 20⅝, Tottenham "B" at 101¼ and 101½, ditto debenture at from 100½ to 101, Wandsworth and Putney "B" at 133½, and West Ham preference at 122½. Brentford old rose 3; and on the local Exchanges, both Liverpool "B" and Newcastle advanced. The Continental Gas Companies were much quieter. Imperial rose a point, with business marked at from 172 to 174. European fully-paid marked 23⅛ and 23¼, ditto part-paid rose ½, and Union was not dealt in. Among the undertakings of the remoter world, Bombay changed hands at 6¾ and 6⅝, Buenos Ayres at 11¼ and 11$\frac{3}{16}$, ditto debenture at 94½, Primitiva at 7, ditto preference at 5$\frac{3}{16}$, ditto debenture at from 94¾ to 96, River Plate at 13 and 13$\frac{1}{16}$, and San Paulo at 12$\frac{13}{16}$.

ELECTRIC LIGHTING MEMORANDA.

Continuity of Management—Powers and Decisions of the Local Government Board—Disposal of Surpluses—London County Council Incensed—Net Profit Atoms at Hastings—A Rate-in-Aid through Street Lighting—Undischarged Accommodation.

THE Incorporated Municipal Electrical Association have been meeting in Sheffield, under the presidency of Mr. S. E. Fedden—a gentleman whom we admire, and who has the sympathy of his professional brethren in that he has to conduct a municipal electrical undertaking with a Gas Company uncontrolled in the lowness of the price at which they may sell gas, successfully opposing, by their modest views as to charges, all the efforts of the municipal electricity department to make really substantial progress. Another cause for sympathy is that some impertinent inquirers into the affairs of the department have discovered that, though the salaries bill amounts to £5201, only £1348 is visible in the accounts. They are asking whether the staff has been paid, and, if so, who has befriended the department. However, more of this when the mystery has been cleared up. Meanwhile we see, in his presidential address, that Mr. Fedden has been teaching his masters their business, and inferentially suggests that, in the continuity of the management of private enterprise by Boards of Directors, we have a far preferable system to that which exists in the case of the management of municipal trading undertakings. This is a fair deduction from his statement that the continuity of chairman and principal members of committee is essential to the successful development and well-being of a municipal department, and particularly so in the case of electricity supply where the intricacies of working cannot be grasped in a short time. Mr. Fedden's ideal continuity is all right so far as it goes. But local government has not been constructed on a basis that provides for such continuity, nor would it always be advisable for the happiness of officials and the well-being of undertakings for some councillors to be installed in perpetuity—so far as human capacity would allow—in the places of honour and influence. Municipal electrical engineers no doubt (like the chief officials of other municipal departments) can point to a few despots—conceited and high-handed—for whom they have often mentally wished a speedy release from the further claims of public office, if not a complete transference from this terrestrial ball to some other place. To such individuals, the continuity pleaded for by Mr. Fedden would be flattering and agreeable; to the chief officials concerned, the bare vision of such continuity would be an ineffable horror. However, given good men, the principle is one that would certainly be advantageous.

There were many subjects touched upon, briefly but seriously, by Mr. Fedden in his address. He echoed the view of municipal electrical engineers—especially of those who, through the miserable condition of their department's finances, have had to go under the harrow of the Local Government Board—that the Board and their Inspectors are clothed with very comprehensive powers, which are sometimes found rather inconvenient by municipal authorities with electricity undertakings hanging round their necks. We are persuaded, from a careful study of the proceedings of the Board in this connection, that it has been a good thing for many communities that the Board have such comprehensive powers. Mr. Fedden again does not like the recent practice of the Board in only sanctioning loans for specific purposes. In electricity undertakings where the constituent parts of the plant and appliances have such widely variable life, it is impossible for the Board to satisfactorily consolidate loans and equate the periods of repayment. They did this at one time; but it did not work fairly, and many an electricity undertaking is in consequence the worse off to-day. Another question has reference to the payment of permanent employees engaged on capital work. The Board have resolutely set themselves against the practice favoured by municipal departments of paying such employees out of capital. It is true the financial advantage is on the side of the undertaking by the charge being made against revenue; but we are not at all sure that it is politic for the Board to be too insistent on the point, as it will be an inducement to having all work executed by contract when, in slack seasons, on some classes of employment, the permanent hands might well be kept fully engaged. There are, however, considerations affecting both sides. The President of the Local Government Board has declined to receive a deputation on the subject; and the House of Commons is to be moved on the matter on the occasion of the presentation of the estimates of the Board. We are glad to find that Mr. Fedden does not believe in handing over surpluses in aid of the rates, although he has not been troubled much with surpluses for disposal in any manner. He considers that, when a suitable reserve fund has been accumulated to deal with premature antiquation of plant and unforeseen expenses, any surplus might be devoted to street lighting and reduction of tariffs to consumers. He had better, with gas at the Sheffield price, be prudent, and leave street lighting alone—devoting any surplus he may succeed in obtaining to a reduction of price to private consumers. He has a good example in the Sheffield Gas Company.

The feeling expressed in our editorial columns last week also strongly possesses the London County Council, that their Electricity Bill met with its end purely on political grounds, and not on its merits as a means of giving—what is believed by some people to be necessary—a bulk and power supply of electricity in London, without risking the ratepayers' money or hypothecating the credit of the Council. The Parliamentary Committee presented last Tuesday a report to the Council on the subject of the summary dismissal of the Bill; and certain of the statements in the report were obviously merely gossamer coverings of more acute feeling. "We can only hope," the Committee modestly remarked, "that the needs of consumers of electricity in London, and the wishes of the ratepayers have not in the present instance been made subservient to the political convictions of the [Hybrid] Committee." The Hon. W. Peel, in moving the adoption of the report did not evince the slightest reluctance in presenting the position in a much stronger light through the employment of unequivocal language. He frankly declared that the real reason for the rejection of the Bill was that it was promoted, supported, and furthered by the Municipal Reform party. There is no doubt that Mr. Peel is right. The matter, however, is really a larger one than the mere rejection of this particular Bill. It is Parliament setting itself against the seriously expressed wishes of the people, on a straight issue, at the polls. If this is to be the mode of legislation under the present Parliament, there will be little use anyone who is not of the same political view as the Government promoting Bills of a controversial nature; for it is plain that they will not be dealt with judicially, but politically. Under the circumstances, the County Council being pledged to the people of London not to run any financial risks in this matter, it is useless for them to approach the question again; for what will please the ratepayers will not please Parliament, and what will please Parliament will not please the ratepayers. The Council are not at present proposing to do anything more in the matter (although there is plenty of time before the next Bill-depositing season comes round); but they have recorded their deep regret that the Bill has been rejected, "thereby depriving the elected representatives of municipal London of the opportunity of securing the provision of a cheap supply of electricity, subject to public control."

When the accounts of municipal electricity undertakings are published, they often let light in on past events. At Hastings, during the last few months there has been a fresh outbreak (in print) of the gas-electricity controversy; and the accounts of the Corporation Electricity Department just published show how

sorely the undertaking is in need of all the puffing of the virtues, and repressing of the demerits, of electricity that the wit of the hard-pressed Electrical Engineer can devise. The accounts impute to the electricity undertaking the making of a net profit of £198, against £117 the previous financial year. Of course, if the electricity undertaking had any susceptibility on the point of honour, it would rise up in righteous indignation, and repudiate the making of these particles of net profit in a fair and square manner. Take one point only. In 1906, the Gas Company paid in local rates and taxes £2762 on a gross profit of £23,977, or 2s. 3¼d. per £1. The Electricity Department paid £250 for rates and taxes on gross profits amounting to £10,606, or 5½d. per £1 only. If the electrical undertaking had paid at the same rate as the Gas Company, there would have been a deficit of at least £1000 last year. But what about the current year? The new lamps in the streets are consuming less electricity; and the price of fuel has gone up. The charge for current, too, to private consumers has gone down—the Electricity Committee finding that the high prices of the past are no longer maintainable. In comparison with other towns of the size of Hastings, the figures are still high—ranging as they do from 5¾d. to 4¼d. per unit, according to quantity used. The Committee will have something to do to get through this year without a deficit, especially if they insist on levelling up the rates and taxes to the line the Gas Company have to toe. A correspondent in a local paper suggests that this over-indulged municipal concern should be disposed of or leased to a company.

On the subject of the contribution that street lighting makes to the support of electricity undertakings in many places, an instance is found in the report of Mr. Carson Roberts on his last audit of the Islington Borough Council's accounts. The ratepayers will read with some surprise, not unmixed with sorrow for themselves and displeasure with the old Borough Council, that the charge made for current by the electricity undertaking of the Council for street lamps is at the rate of 3·31d. per unit, which is twice as high as the average amount charged in other Metropolitan boroughs. The Electrical Engineer agrees that about 1¾d. would be a reasonable and fair charge. Mr. Roberts adds: "The charges for public street lighting represent in this case a full third of the gross income from the sale of current, and means in effect that a rate contribution in aid of the undertaking to the extent of about £7000 per annum is now being treated in the accounts as payment for street lighting." There is no need to attempt to add to the cogency of this statement. A Special Committee of the Shoreditch Borough Council have discovered another way of reducing the cost of street electric lighting, other than by reducing the cost per unit. This Committee have recommended that the illuminating power of the arc lighting in six circuits should be curtailed by 20 per cent., at an estimated cost of £150. The ultimate saving is calculated at £750 per annum.

There was a Local Government Board inquiry just recently at Belfast regarding an application for £75,000 for the extension of the electric lighting undertaking; and such a good character was given the Inspector as to the "sound financial position" of the concern that it may be suggested the time has arrived when the financial accommodation rendered by the Gas Department in the years of tribulation of the electricity undertaking might be discharged. It was stated that the Committee are now in a position to set aside for depreciation and renewals 9·3 per cent. of the capital, which is much above the average of municipal undertakings. The net profit for last year, after paying interest and sinking fund, amounted to £11,478. The cost of production, too, is extremely low; and the published returns show that the Belfast costs for last year—0·634d. per unit—are the fifth lowest in the kingdom, notwithstanding the present high cost of coal in Belfast. Assuredly the concern is now in a position to discharge its obligation to the competing undertaking.

Molybdott.—It is reported from Paris that a young student at the School of Medicine at Rochefort—M. André Lancien—has made the remarkable discovery of a substance which he calls "Molybdott," and which is said to possess the same properties as bromide of radium, but costs only 20 frs. instead of 3000 frs. per gramme. The Academy of Sciences has already been informed of the discovery.

The Patents Bill as Amended.—Some weeks ago we noticed the publication of a pamphlet by Messrs. Ernest Lunge and Bernhard Dukes containing some critical notes on Mr. Lloyd-George's Bill to amend the law relating to patents and designs. Since then the Bill has been considered by a Standing Committee of the House of Commons; and a second edition of the pamphlet was issued last Friday, containing the Bill as amended. The Committee have nearly doubled the size of the draft Bill by the insertion of new clauses and sub-clauses which, in the opinion of the authors of the pamphlet, have not improved it. They say that the original Bill threw the law of patents into anarchy and confusion. The Standing Committee, we are told, have done worse, for "they have gutted the rights of patentees, and made the British letters patent a document deprived, by the texture of the paper prescribed, even of utility for pipe-lights." For the justification for this strong statement we must refer those of our readers who are interested in the subject to the pamphlet itself, which is being published by Messrs. Stevens and Sons, Limited, Nos. 119 and 120, Chancery Lane, at the price of 1s.

THE CENTENARY OF GAS LIGHTING.

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Lighting, both for public and for private purposes, has been, and will ever be, a highly controversial subject. In fact, it has been so ever since the time of the curfew, or when the citizen was compelled to light that portion of the street which was outside his own house, by exhibiting a "lanthorn" over his door, between the hours of sunset and midnight, on certain nights of the year, defined in the calendar by the Festivals of Saints, whose natal days occurred in that period which was of the darkest. When a man should go to bed, and how much he should contribute to the common weal, in oil or tallow, for the benefit of those whose business or pleasure kept them out of their houses after sunset—these were matters which, in those early days, continually agitated the public mind.

Old records inform us that the Commonalty, as expressed by the elected representatives, and those who elected them, were continually at variance as to the effectual lighting of the public streets. One edict was to the effect that every citizen should exhibit a candle over his door.* The law was obeyed, but the candle was not lighted. A further regulation, it is said, was made that everybody should light the candle by law "exhibited." He did so; but after it had been lighted, the wind would blow it out, and the citizen saved his tallow. The regulation was then amended and it was decreed that all should hang lanterns over their doors. This was quickly done; but as nothing was said about candles, they were left out. The authorities went over the ground again, and decided that the lanterns should have candles therein. Once more the law was obeyed; but the candles were not lighted. It was next decreed that the lanterns should be lighted; and careful citizens only put in very small pieces of candle which soon burnt out. The length of the candle to be lighted was then specified; but the controversy has never ceased. Instead of being fought around "candles," it has waged around "candle power," with an intensity that makes the battles of those crucial days appear quite small things. So badly were the public streets lighted in the days of "Bluff King Hal," that highway robbery was committed with impunity. "Hang up the thieves, and let honest men stay indoors," was the King's advice; and so well was it carried out that it is stated that no less than 72,000 persons were hanged in his reign.

In these articles, it is proposed to omit the earlier references to the discoveries and manufacture of gas by Murdoch and those immediately preceding him, and rather to chronicle the history of gas lighting during the past hundred years. This month of July, 1907, well deserves to be termed an epoch-marking period in the history of gas-lighting, completing as it does the Centenary of the introduction of gas lighting as a practical means of illuminating the streets in the centre of the Metropolis. True, a little earlier, in the year 1803, Frederick Albert Winsor, a German by birth, lighted the Lyceum Theatre with gas; and on Jan. 28, 1807, a display on a large scale (judging by the prints published at that time) had been provided by Winsor in Pall Mall, for the benefit of the West End. While the crowd still lingered and gazed at "the long line, between St. James's Palace and Cockspur Street, that did blaze out in a burst of gas-lamps to the no small wonder of the public," and Sir Walter Scott, in writing of Winsor, was saying "There is a madman proposing to light London with—What do you think?—Why with smoke!" and while even Sir Humphry Davy and both the popular and scientific Press were expressing hesitation at the proposal, the City Lighting Authority not only considered, but had had installed, a practical demonstration of street lighting in their area. In a circular dated July 10, 1807, the Clerk to the Lighting Commissioners states that: "Having had an offer to try the experiment of lighting the public lamps with gas, the same will be put into execution in Golden Lane and Beech Street, in the Ward of Cripplegate Without, Monday night next, and continued every night until the following Monday (July 15 to 22)." The experiment was so satisfactory that it at once became the permanent illumination.

In 1808. Murdoch presented to the Royal Society his account of the application of gas-light for which he received Count Rumford's Medal. In the year 1810, the indefatigable Winsor, after much opposition and many defeats (being strongly opposed by Murdoch in his endeavour to start the National Light and Heat Company), succeeded in obtaining an Act of Incorporation, entitled the "Gas Light and Coke Company," with a capital of £200,000. The enterprise was looked upon as visionary, though the Royal Charter was granted to it in 1812. Yet the privileges of the Charter were neither liberal nor encouraging; the powers granted being extremely moderate, and the restrictions many. The Gas Light and Coke Company thus established commenced operations on a site now occupied by the Civil Service Institution, in Cannon Row, Westminster. But not much was done in the practical application of gas as a lighting agent; and just when the promoters were losing heart, the Company were fortunate in securing the services of Clegg, as Engineer, who brought his experience and genius to the task of surmounting the obstacles that lay in the path of progress.

In December, 1813, Westminster Bridge was first lighted by gas; and the year after, the oil-lamps were removed from the

* "Sermons in Candles," by C. H. Spurgeon.

streets of the parish of St. Margaret's, Westminster, in favour of gas-lights. In 1815, the Guildhall was lighted by gas; and the public Press teemed with the most extravagant praise of it—"as shedding a brightness clear as summer's noon, but undazzling and soft as moonlight, though forming a magnificent combination worthy the inauguration of the presiding citizen." The year 1816 found a large part of the Metropolis illuminated by gas; more than 4000 argand burners having been put up, while arrangements were being made for a large extension. At this date, the total length of mains in London was about 26 miles.

The apparent slight that had been thrown upon this new branch of civil engineering may have kept some sensible and well-disposed persons from wishing it a success, and have somewhat retarded it. But now a considerable advance seems to have been made with the new light. The avenues to the House of Lords and House of Commons, the residence and offices of the Speaker, the Mansion House, and many important places, adopted gas at this period. To gather an idea of the rapidity of main-laying, the gas historian of that time states that the Liberty of Norton Folgate, as far as Bishopsgate, was lighted with gas from the Chartered Company's station at Norton Folgate; and pipes were laid from that station as far west as Cheapside, and all streets north of that thoroughfare. In the West-End, the mains for supplying the streets and houses by the Gaslight and Coke Company extended northwards through the most eligible parts from their establishment in Peter Street, Westminster, along the line from Pall Mall to Temple Bar, completely surrounding the area of St. Martin's-in-the-Fields. "Main pipes" were also laid in the Haymarket, Coventry Street, Long Acre, St. Martin's Lane, and the Parishes of St. James and St. Ann.* In the East-End of the Metropolis, mains extended from Cornhill to St. Paul's, Wood Street, Fore Street, &c. Consent had also been given to the Incorporated Gaslight Company for laying pipes in the parishes of St. Paul, Covent Garden, St. Mary-le-Strand, St. Clement Danes, St. George, Bloomsbury, St. Giles-in-the-Fields, St. Andrew, Holborn above the Bars, part of St. Mary-le-Bourne, and the whole of the City and suburbs of Westminster. Still farther East, the same Company were engaged laying their pipes in the principal parts of Whitechapel, Spitalfields, and St. Luke's. One part of the City of London, from Temple Bar to the west end of Cheapside, from Newgate Street to Holborn Bars, together with the neighbouring streets, was also provided with pipes laid down by another Gaslight Association, who had opened a new establishment in Water Lane by Fleet Street, but were unconnected with the Chartered Company. A third Company was projected in Southwark, and a fourth in the East of London, "creating a rivalry of interest—that laudable competition which always proves beneficial to the public at large, and which cannot fail to accelerate the progress of the new art of procuring light." If Accum, the writer of these remarks, could have foreseen the chaos and ruin, as well as the set-back to the gas industry, that followed this wasteful competition, he would have considered before using this closing sentence. Clegg, under whose direction the new system of lighting was being principally carried out, speaking in 1816 of the progress made with the work, said that the main pipes of his Company alone amounted to nearly 15 miles; while it is interesting to learn that one church in the Metropolis had been illuminated with gas-light for upwards of two years, "the lights employed in this edifice being equal to 360 tallow candles, eight to the pound."

"Enough, therefore," says the early writer, "has been done to prove the possibility of lighting house and street with gas, which would have been regarded twenty years ago as an extravagant paradox. From the distinguishing forms which the flame is capable of assuming, no light is better calculated for signal lights. If every lighthouse around this island were possessed of a gas-light furnace, one-half of the enormous expense of the present lighting would furnish a much more brilliant light. Another application of gas would be the lighting of barracks, arsenals, &c.; the annual expense of lighting the barracks of Great Britain being about £50,000, a small part of which, on the new plan, would supply a much purer and safe light. The uses of the lights enumerated must of themselves justify in attaching great importance to the discovery, and if reduced to practice all over the Kingdom would employ a large capital in a way the most advantageous and productive."

Illumination by gas was now beginning to make headway; but it was not to be expected that the event, however practicable, of extending it to the dwelling-houses of every town and village should take place at once. Prejudice had to be eradicated, and established habits altered—all of which was a work that nothing but time could effect. The education of a whole generation of men had to be accomplished before such a theory of lighting could be established, so slowly at that time did improvements of any kind make their way into common use. Here was an invention calculated to economize labour and increase comforts, which was neglected to be taken advantage of. Other circumstances besides prejudice were unfavourable to the new invention—ignorance, vested interests, jealousy, malice, all of which so often obstruct the progress of improvement and prevent plans coming to fruition for the public good. Such a revolution as gas lighting was going not only to alter domestic habits, but to give a new direction to part of the skill and capital of the country.

In mustering their full strength against the introduction of the new form of illumination, an endeavour was made to move the public mind, by dismal forebodings of the Greenland trade and the loss of the nursery of British seamen. The objection to the Greenland industry was futile. The nature of the Greenland service required that the crews should consist chiefly of able-bodied sailors; and being "protected" men, not subject to "press" for the Royal Navy, they were rendered useless for National Defence. And even on the extreme supposition that the gas industry was going to put an end to the Greenland fisheries altogether, "was there," says Accum, "much to regret in it? Why fit out vessels to navigate the Polar Seas for oil, if we can extract a superior article for procuring light at a cheaper rate from the produce of our own soil? The fisheries will find ample encouragement; and the consequence of the lighting of our streets with gas can prove injurious only to our Continental friends, one of whose staple commodities—tallow—we shall then have less occasion to purchase." So strong was the opposition, that Lewis Thompson, in a paper on "Coal Gas, and Its Application Considered for the Purpose of Generating Light and Heat," written in the late fifties, said: "It has long been remarked as a matter of surprise by intelligent foreigners that in a country like Great Britain, where the Arts have attained an unprecedented development, there should be one incessant struggle, one prolonged fight, betwixt ignorant prejudice on the one hand and practical knowledge on the other—in fact, betwixt darkness and light. In return for the promulgation of an idea, which now illuminates every large town in Europe, Winsor received the jeers, the scoffs, and even the hate of those he tried to benefit. He met with an opposition as furious as it was uncalled for, and no doubt felt the benumbing influence of popular discouragement, though supported by a noble body of Directors, evidently not unsuited to the trying nature of their position. It is, of course, very difficult in the present day to guess at the progess which might, under favourable circumstances, have been made by Winsor alone in the manufacture of coal gas; for he certainly understood the whole subject, and might have placed it considerably in advance of its existing condition, had Society been then capable of receiving it. But he was checked on all sides, and experienced none of that enthusiastic national sympathy which has so lately given so glorious an impetus to our railway system. On the contrary, he had to conquer every inch of the ground which he wrung from public prejudice." Thus the early opposition to gas lighting was nothing more than the common clamour always set up against every new means of lightening labour.

At this time (1816) it was laid down as a rule that no private individual resident in London should attempt to light his premises for the sake of economy with coal gas by means of his own apparatus whose annual expense for light did not exceed £60. From experiments made by Clegg during the first eight years of gas lighting, on the effects produced by a number of gas-lights of a certain intensity, he had reason to believe that streets of small towns might be illuminated at a cheaper rate by means of a tower or pagoda, than could be done in the ordinary way by street-lamps; the gas being conducted to the top of the building, and the light directed down by reflectors at certain angles. By this means, the mains and services were to be saved, to compensate for the cost of the pagoda. In 1815, it was held to be conclusive that the lighting of a parish by street-lamps only, without lighting the shops and houses, could not be accomplished with economy.

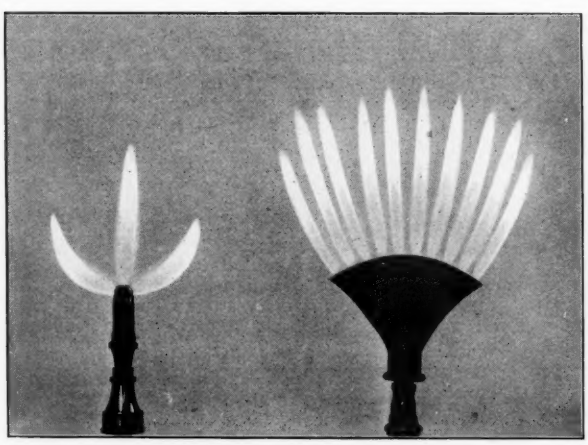
Trouble being experienced at this time with regard to the charge made for gas, Clegg, the Gas Light and Coke Company's Engineer, came forward with a remarkable invention to meet the case. He had previously, with a view to allaying any alarm on the part of the public, invented a self-extinguishing gas-tap, so constructed that the gas could not flow to the burner when the flame became extinguished; for if the flame was blown out, and the cock left open, the valve automatically shut. This action depended upon the expansibility of a metallic rod heated by the flame of the lamp, and its contraction when the flame was out. His later invention was, however, more wonderful, and is with us to-day; it was called "Clegg's self-acting gauge"—a machine which "measured and registered, in the absence of the observer, the quantity of gas delivered by any pipe connected with the gas-main." The machine occupied a space of about 2 feet by 1 foot; and "if put up in a room, house, or other place where gas was burnt, it would, at any time, by mere inspection, give an account of the quantity of gas consumed." This is a description of the first gas-meter; for at that time consumers paid for their gas by rent, at so much per light—by which we have the terms "gas rent" and "rental department." Clegg's gas-meter was further described as for "checking the conduct of workmen on the works, and enabling the manufacturer of coal gas to ensure himself of obtaining at all times the greatest possible produce from his establishment—a measure by which he can deal out the gas in whatever quantities they may require it." In those early days advantage was taken by the unscrupulous to get more than they paid for from the gas manufacturers; for we find it on record that "every person must have noticed how shamefully many disregarded the terms on which they have contracted for a supply of gas—some by means of the excessive flame they keep up, and others by suffering the lights to burn hours beyond the time." In places where gas was supplied on contract to pay for burning a limited time, by means of certain sized burners, "the seller was

* Accum's "Practical Treatise of Gas-Light" (1815) and "Description of the Progress of Manufacturing Coal Gas."

always in a degree, and in some cases wholly, dependent on the care and honesty of the purchaser." On the introduction of the Clegg gauge, equal justice was done to both the consumer and the seller; and, to use the words of Accum, "the waste being transferred to those who occasioned it, the price of gas was reduced to an equitable and correct measure of value."

The benefits had a wider range; for not only was full value secured to the maker for the whole of the gas manufactured, but it became a more marketable article. In the system of charging by the year, half year, or quarter, many who were only in want of gas occasionally, or whose demand was irregular or uncertain —such as the proprietors of theatres—were debarred from availing themselves of it, except at an expense disproportionate to the amount consumed. Here we find in Clegg a man of indomitable energy and force, as well as of an inventive faculty, who saw the early difficulties of gas lighting, only to surmount and overcome them. Without his help, Winsor (with all his wonderful powers of organization and "push") would have made but little headway against the strong opposition existing; but allied to a man of experience and constructive genius like Clegg, progress was made, customers were won, and gas lighting became an established fact. Thus in 1819 the extraordinarily rapid progress which coal gas had made in the United Kingdom was, we are informed, "without a parallel in the history of the useful Arts." It was expected in these early days that the Chancellor of the Exchequer would levy a tax on the "new lights;" for it was remarked that "in proportion as gas-lights are more or less generally adopted in all towns of the country, the consumption of oil and tallow will be diminished, and the income on those articles will become less productive."

The definition given to mains at this date is not uninteresting—*i.e.*, "Cast-iron pipes, from 2 inches in diameter and upwards, placed underground for conveying gas into smaller branch-pipes, but in a more extended sense." The term is applied to every



Photograph of "Coxcomb" and "Cockspur" burners, lent by Professor Lewes.

pipe from which "smaller ramifications or branch-pipes proceed." Again, "All mains destined to convey coal gas should be proved by being submitted to the trial of sustaining a column of water 300 feet high."

The burners then in use were the cockspur, cockscomb, batswing, rattail, and argand. The first named seemed to have consisted of a hollow globe about $1\frac{1}{2}$ inches in diameter, pierced laterally with from three to five holes of about $\frac{1}{30}$th inch diameter. Out of these, flames issued in straight jets. Naturally, the combustion was not perfect, and it was also a wasteful manner of burning gas. The hot-air currents gave the upward tendency to the long spikey flames which took the shape of a fleur-de-lys, and also caused them to curve in the form of a spur of a game-cock. The consumption of the cockspur was $3\frac{1}{2}$ cubic feet per hour; that of the batswing being 5 cubic feet. The flame of the rattail burner consisted of a long upward spike. The photograph of the cockscomb and the cockspur burners here reproduced has been lent by Professor Vivian B. Lewes, who informs the writer that recently, when in Ireland, he saw rattail burners still in use.

It is curious to note the early instructions given to the workmen in laying supplies: "Pewter, tin, lead, or other pipes capable of being melted by a gas-flame should never be employed through the interior of a house, because of the ease with which such pipes might be perforated, and the serious consequences that would ensue if the gas issuing from the aperture were lighted." Copper pipes, being cheaper in those days than iron, were largely used by the several companies; the objection to corrosion by stopping, which on the introduction of gas was complained of in many places, no longer existed, it being pronounced that pure coal gas produced no action on the copper tubes. Such copper tubes laid in London more than ten years previously, were found to be in a state of perfect preservation.

So much for the description of the work and methods of the pioneer Gas Companies, and their energetic officers—particularly Clegg, who stood head and shoulders above his compeers at that date, and who afterwards became the author of a standard work on the "Manufacture and Distribution of Coal Gas," which ran into many editions.

When the obstacles and prejudices were overcome, and large amounts had been spent on experimental work, a great boom took place. Between the years 1814 and 1819 rival companies arose, especially in the Metropolis. The Phœnix or South London Company had their Act in 1816; the City of London Company in 1817; while the Imperial Company had commenced by 1820. In 1823, the Ratcliffe Company, and in 1829 the Independent Gaslight and Coke Company commenced operations. The City Gas Company and the Chartered Gas Company were permitted under a contract with the authorities to lay down their pipes, with a distinct written agreement that at the expiration of a given time the City should be entitled at their own pleasure to purchase them by valuation. The two Companies, however, partitioned the City between them under a secret agreement known as the "Congreve Compact"* and thus established a practical monopoly.

In 1823, when London north of the Thames was being supplied by four Companies, oil gas began to attract a large amount of attention; and an attempt was made to start the London and Westminster Oil-Gas Company, to the alarm of the coal-gas industry, who opposed and petitioned against the proposal in Parliament. In 1824, Michael Faraday gave evidence in favour of the Bill; and eventually, on a report of the Inspector of Gas-Works (Sir William Congreve), investigation was made by a House of Commons Committee, to the undoing of the oil-gas project. The opposition of the gas companies to the measure cost them some £30,000, though several witnesses of the Oil-Gas Company who had had charge of oil-gas works, admitted a loss on them without the employment of coal gas as an adjunct. In spite of this, Bristol was being lighted by oil-gas in 1823 under a Special Act, in the face of warnings which in a few years were verified. In 1825 the Imperial Continental and the European Gas Companies were commenced, mainly through the instrumentality of Sir William Congreve.

Following shortly after this came one of the most remarkable periods in the gas industry, when a ruinous rivalry set in among the various companies. Many of the concerns paid not a farthing in dividends, while others were almost ruined. But this did not prevent the multiplication of undertakings. For instance, in the Metropolis, the Imperial Gas Company never paid a farthing from the time of its inception; and similar remarks apply to the City of London and Phœnix Companies. Only the Chartered Company paid a dividend; but in spite of this the South Metropolitan Company was launched in 1833, for the purpose of supplying cannel gas, and was incorporated in 1843. So precarious was its early existence, that it was seven years before the unfortunate shareholders received any profits. In 1847, it is found with a capital of no less than £19 per ton of coal, equalling about £2000 per million cubic feet sold; but by careful management this amount was reduced for the year 1860 to £550 per million feet —thus in twenty years bringing the capital charge down to about one-fourth.

In the summer of 1842, a Committee was formed to investigate the impurities of gas, and the injuries done by the products of burnt gas. The services of Professors Faraday and Brande, Mr. Aikin, Mr. Brown, and Dr. Prout were enlisted. Without going into the detail of their investigation, which went to show that oil of vitriol was the great cause of the mischief, a summary of Dr. Prout's findings may be interesting. Two equal portions of the water used in the Athenæum Club had been exposed to the air of the drawing-room of that establishment for a fortnight; and he found that it thereby acquired a striking increase of sulphuric acid, so that when it was evaporated nearly to dryness, it distinctly reddened litmus paper, and showed the presence of free sulphuric acid. "This," said Dr. Prout, "sufficiently explains the destruction of the club books; nor will there be any improvement till the gas is either removed or its fumes conducted away by appropriate chimneys." Professor Faraday and Mr. Aikin agreed in this opinion; and the Committee resolved—"That as from the above experiment it appeared that much of the injury suffered by the books in the library is owing to acid vapours evolved by the combustion of the gas, it is advisable, for the preservation of the library, either that the gas should be discontinued or that some arrangement should be adopted for carrying off the fumes by an improved system of ventilation." Professor Faraday suggested the latter, which was adopted.

Continuing, the Equitable and the London Gas Companies were launched to oppose companies already in the field—with fatal results, as for nearly twenty years they both failed to earn a dividend. The London Company, which was situated partly north and partly south of the Thames—in the Strand and Lambeth respectively—was destined to play an important part in the question of differential prices for gas in London. The Company was established in 1830, and incorporated by Act of Parliament in 1843. The mains were laid across the river; the works being at Vauxhall. Later a move was made to new works at Nine Elms. So happily were they placed that shortly after this their troubles ceased, and 10 per cent. was paid on the original shares. The Commercial Gas Company, for supplying the east of the Metropolis, was incorporated in 1847.

At this date, the "Gas-Works Clauses Act" was passed, for the

* Sir William Congreve's arrangement of "agreed areas."

purpose of consolidating in one Act "certain provisions usually contained in Acts authorizing the construction of gas-works for supplying towns with gas."

In 1848, a report was presented to the London authorities by Mr. Charles Pearson, and published in all the newspapers, wherein he demonstrated that the price of gas (then 6s.) ought to be governed by the cost of distribution, rather than by the cost of production.

On Dec. 3, 1849, the Directors of the newly-formed Great Central Gas Consumers' Company presented a lengthy petition signed by Thomas Dakin, setting forth the benefits of competition, and promising many privileges to the citizens—*i.e.*, (1) To supply the citizens with a brighter and purer gas; (2) A free meter and a free service, stamped and subject to inspection; (3) To supply the street lights with better gas at a lower rate; (4) The gas to be tested from time to time by eminent professors of chemistry under heavy pecuniary fines on the contractors.

The Directors adopted 9½ sperm candles as the standard of comparison for their gas, as recommended by Clegg; but the authorities fixed 12 wax candles in the Bill, which was higher than 9½ sperm candles. Printed documents distributed, said: "We will supply you with 9½ sperm candle gas as reported by Mr. Clegg, as a high average, at 4s. per 1000 cubic feet, which, if you will take 300 millions per annum will yield a dividend of 10 per cent. If you take 450 millions, we will supply at 3s. 6d., and if 600 millions you shall have it at 3s.; for we are advised that quantity has an important influence over price." It is worthy of note that under this Act of 1851 the supply of gas was voluntary on the part of the Company, though all legislation afterwards made it compulsory.

Competition was now universal, four or five companies supplying one district. On the south side of the river four companies were supplying Walworth Road, each having a main on both sides of the street—giving eight mains for one thoroughfare. This competition was disastrous; for the companies rarely paid anything like full dividends, and the provision of the 1847 Act was, when full dividends were paid (viz., 10 per cent.), a reserve fund of one-tenth of the capital was to be accumulated. After that any further surplus was to go in reduction of price. The Act allowed companies to make up their dividend deficiencies of earlier years; and thus full dividends were practically assured by the Legislature. The price of gas was not reduced; nor was it likely to be under such conditions. During 1847 the price was about 6s. 6d. per 1000 cubic feet; and the South Metropolitan Company paid 6 per cent. Most of the other companies paid less—with the exception of the Imperial Company, who were in the happy position of paying 10 per cent.

With competition so very rife, and so many companies supplying one area, the consumers were the only ones who reaped any apparent benefit, and this often of an unscrupulous kind, by obtaining their gas for years without any payment whatever. When the supply was disconnected by one company for non-payment, a nominal deposit would induce a rival company to lay on a supply; and often three services were in the premises at one time. Dishonest consumers could thus take advantage of the secrecy observed by the rival companies to obtain their light free. Concessions of every kind were made to consumers to obtain their patronage, even to the extent of allowing one or more lights to be supplied free of charge. The company would alter fittings gratuitously; while gas would be sometimes supplied at one-third of the sale price. District inspectors had full powers and a free hand (including a commission) to get customers the best way they could—not new customers, it may here be mentioned, but "turnovers" from the other companies. Ready cash changed hands in these transactions. A customer obtained, a meter would be left. A week or two later, another company would undertake to supply the customer by contract, with the addition of two or three free lights. Then as the mains of the three companies were side by side in the road, it was not an unusual occurrence to find that a company was drawing payment for gas taken from an opposition company's main. This was not the only source of loss to a company; for, in addition—in consequence of the hurried manner in which the mains were often laid, and continual changing of service-pipes—considerable escapes were always taking place, swelling the total of unaccounted-for gas. The difficulty was to bring to book the offending company, as the officers threw the responsibility upon their rivals; and in the event of a leakage being discovered on the mains of one company it was not unusual to attribute it to wilful damage on the part of a rival's workmen. In fact, the spirit of competition reached the point of personal animosity among the directors and officers of the various undertakings. Owing to the manner in which the pipes of these rival companies were hurriedly laid, explosions were the order of the day; and each company made the most of its rival's troubles.

In spite of all this ridicule and opposition, the Great Central Gas Company was formed by Mr. Charles Pearson, and Mr. Alexander Angus Croll, who afterwards became Sheriff. The Company started with the promise to supply gas at 4s. (and had a clause in their Act to this effect), to be reduced to 3s. 6d. and 3s. per 1000 cubic feet as soon as the consumption would enable the Company to make the reduction out of the "excess of profits after paying their shareholders a dividend of 10 per cent." Needless to say, the Company never got below 4s. The Great Central Company also agreed to have inserted in the Act a clause giving free meters and service-pipes to consumers. They had power to pay deficiency in dividends of previous years that were below 10 per cent.; and they were not compelled to form a reserve fund. The Act had a clause in it stating that the Company should not supply gas to any lamp or burner in any street, church, chapel, &c., in the east of London, except in the districts of the British Gaslight Company, the Ratcliffe Company, and the Commercial Gas Company, and then only on payment to such companies of 40s. for every lamp or burner supplied. A similar penalty applied to certain parishes which were in the districts of the Gaslight and Coke Company and the City of London Company—penalties being recoverable.

Thus the period of supply between the time of the passing of the Gas-Works Clauses Act of 1847, and the coming into force of the Metropolis Gas Act of 1860, was one of unrestricted competition. In 1848, the price of gas was 6s. per 1000 cubic feet all over the Metropolis. The "cheap gas" agitation then spread to the south of the Thames; and Mr. John Thwaites, a draper in the Borough, who afterwards became Sir John Thwaites, the originator, and first Chairman of the Metropolitan Board of Works, was the prime mover. Sir George Livesey (then a lad, at the Old Kent Road works, under his father), speaking of these times, says: "1848 was my advent into the gas industry; and I remember quite well, as a youngster, attending a public meeting, and hearing Mr. John Thwaites speak. They demanded a reduction from 6s. to 4s. If the companies had been reasonable and reduced it by 1s., to 5s., I think it would have stopped the agitation; but the companies were obstinate, and persisted in the 6s. price."

The result of the agitation was the immediate starting in South London of the Surrey Consumers' Company, also by Mr. Thwaites and Mr. Croll. This Company likewise started with the promise to supply at 4s. per 1000 cubic feet. These two "Consumers' Companies," born of an agitation of aggrieved ratepayers and gas consumers, speedily brought down the price of London gas from 6s. to 4s. The South Metropolitan Company had been previously paying 6 per cent. They had to reduce this to 5 per cent.; and other companies had to do the same. On the passing of the 1860 Act, very few of the thirteen companies now in the Metropolis paid more than 6 per cent., which was looked upon as a good dividend.

In the City, previous to the advent of the Great Central Company, the districts of supply were partitioned out between the City of London Company and the Chartered Company, who alone supplied public and private lighting. The boundary of these two Companies was well defined, no attempt at infringement of it was made, and competition between them was unknown. Other companies were carefully prevented from laying down pipes. But though there was no competition, it was unrestricted outside, which enabled the authorities to submit these facts to the two Companies from time to time, and required what appeared to be a commensurate reduction in the price both in public and private lighting supply. The result was that between 1823 and 1860 the price was reduced by the two Companies from 15s. to 4s., as set out below:—

	City of London Company.	Chartered Company.		City of London Company.	Chartered Company.
	s. d.	s. d.		s. d.	s. d.
1823 .	15 0	15 0	1839 .	9 0	9 0
1824 .	15 0	15 0	1840 .	9 0	9 0
1825 .	15 0	15 0	1841 .	9 0	9 0
1826 .	15 0	15 0	1842 .	9 0	9 0
1827 .	15 0	15 0	1843 .	8 0	8 0
1828 .	13 6	13 6	1844 .	8s. and 7s.	8s. and 7s.
1829 .	13 6	13 6	1845 .	7 0	7 0
1830 .	13 6	13 6	1846 .	7 0	7 0
1831 .	12 6	12 6	1847 .	7s. and 6s.	7s. and 6s.
1832 .	12 6	12 6	1848 .	6 0	6 0
1833 .	10 0	11 3	1849 .	5s. and 4s.	5s. and 4s.
1834 .	10 0	10 0	1850 to 1860	4 0	4s. Competition by Great Central Consumers' Co.
1835 .	10 0	10 0			
1836 .	10s. and 9s.	10s. and 9s.			
1837 .	9 0	9 0			
1838 .	9 0	9 0			

In the year 1850, the contracts for lighting the public lamps having been advertised, the result was the letting to the new company of the public lighting, at a reduced rate. But the public had to submit to the inconvenience of having 1650 holes opened in the paving. In 1852, tenders for lighting were again received. The Chartered Company obtained the portion originally lighted by them, the Great Central Company retaining the remainder; and a further sum was thus saved. Owing to this reletting of a portion of the area to the Chartered Company, and the reconnection of their supply-pipes, and the disconnection of the Consumers' Company's pipes, 1093 holes were opened in the roads. Thus though a considerable saving had been effected, the public suffered by the inevitable opening of the public streets, apart from the fact that the repair of the pavements, and the alteration in the piping, had to be a first charge on the Companies and affected the price of gas.

The price now stood at 4s., until the Companies were districted, which came about in this way: Mr. Thwaites, the originator of the Consumers' Gas Companies, was likewise the originator of the districting. The Surrey Consumers' Company, like the Great Central Consumers' Company, before they commenced, had no end of promises from would-be consumers. As soon as they were ready to start, the other companies reduced their price to 4s.,

and took off meter-rents. Then the customers who had promised to take their gas failed to keep their word. The Surrey Consumers' Company were in a great difficulty. Mr. Thwaites said, "I see competition is a failure." The Companies struggled on for a year or two; and then in 1853, at Mr. Thwaites' suggestion, they agreed to divide South London between them. In 1854, the South London Companies having divided that portion of the Metropolis between them, went to Parliament for sanction for this districting; but, to use Sir George Livesey's words, "the feeling against this monopoly was so strong that Parliament refused its sanction," and so they went on under the agreement until 1860, when sanction was obtained.

(*To be continued.*)

REPORTS OF THE COMMISSIONS APPOINTED BY THE GERMAN GAS ASSOCIATION.

TRAINING COMMISSION.

The report of the Training Commission mentions that the courses of instruction for gas makers and fitters, held at Cologne during the past year in connection with the Associated Royal Schools of Machine Design, have proved successful, and have been attended by 24 students. In Bremen, 71 students took part in the last course. Arrangements are now in progress for the institution of similar classes in Nuremberg, Munich, and Berlin. At Altenburg, 10 students have notified their desire to attend the next classes. The peculiar educational conditions of Altenburg do not render it desirable that the instruction should be given in connection with a lower-grade trade school, in the manner which is recommended in the set of resolutions recently passed by the Commission and recorded below. The school at Dessau has just celebrated its tenth anniversary, and has been attended by 16 students. The results have been partially successful; but it has been found that some alteration is called for in the regulations for the admission of pupils to the classes in gas making. Hitherto a new student must have been 24 years old, must have received a good elementary education, and must have been apprenticed for three years to a master tradesman. The last requirement has proved insufficient in some cases; students having presented themselves who have not been taught well enough to derive full benefit from the classes. On the other hand, pupils of superior education have joined the classes whose only idea has been to use the Dessau diploma in procuring posts as gas engineers in small works. As this is precisely what the Commission has desired to prevent, it has been decided to copy the regulation in force at Cologne, and, as far as possible, only to accept such pupils as have already been engaged on gas-works as qualified furnace builders or smiths, or have been employed as fitters in building or remodelling factories; the whole object of the instruction being to produce leading hands and foremen (not managers for small gas-works) of whom the German industry is so badly in need.

In consequence of the experience already gained, therefore, the Training Commission of the Association came to the following decisions at their last meeting: (1) To reduce to the utmost the amount of theoretical instruction given in the gas makers' and similar classes. (2) To require evidence from each new pupil of his having been practically engaged in a gas-works in connection with the manufacture; and to give preference to such persons as have been employed as furnace builders or working engineers. (3) To hold the classes for gas makers and gas-fitters, when possible, in connection with some lower-grade trade school or similar establishment, such as a building or manual-labour school, or a lower-grade machinery school. (4) To make special endeavours to attract furnace builders and working fitters to the classes, and to give them the best training possible.

At the same meeting of the Commission, Dr. Bunte presented a report upon the eighth course of instruction which he had recently brought to a conclusion at Karlsruhe; and he expressed a desire that the instruction offered to water engineers should be enlarged by the addition of bacteriology—a suggestion that has since been adopted. The courses were held during a fortnight of last March—29 students attending them. The chief part of the teaching consisted in eleven lectures on gas chemistry delivered by Dr. Bunte, which covered the theory and practice of gas manufacture, purification, and the use and employment of bye-products. The lectures lasted an hour-and-a-half each, and were followed by a course of seven other lectures delivered by Professor Eitner, dealing with the more important methods of examining the different substances used in the manufacture of gas. Dr. Eitner's syllabus covered the analysis and calorimetric investigation of coal, the examination of gas, the analysis of tar, liquor, purifying material, and cyanogen sludge, methods for the examination and purification of water, with a special reference to boiler-feed water, the theory and practice of photometry, the measurement of illuminating power at different angles, the determination of illumination, and the use of the Junkers, Le Chatelier, and Wanner pyrometers.

The afternoons of the first six days during which the course lasted were devoted to practical work in the laboratory of the Institute, under the leadership of the assistants engaged there; the subjects dealt with being those that had been mentioned in the lectures delivered in the morning. On two days also demonstrations were given by Professor Klein of methods employed in the bacteriological investigation of water. Two other afternoons were devoted to visiting the gas-works at Pforzheim, where there is a Dellwik water-gas plant, and at Heidelberg, where the water-gas plant is of Humphreys and Glasgow's system. The remaining days were spent in the experimental laboratory of the Association, and in the gas-works at Karlsruhe; the students being shown how to manage retort-furnaces, to analyze the generator and furnace gases, and calculate the excess of air in the latter; to supervise the scrubbers and purifiers, and to estimate the ammonia, cyanogen, sulphuretted hydrogen, and oxygen in the gas; to analyze the bye-products, determining the sulphur and blue in spent purifying material, and the amount of ammonia in the liquor, and in the waste liquid from the stills; and to superintend the water-gas plant. Dr. Bunte also exhibited to the Heating Commission the syllabus of instruction given to illuminating engineers at the Technological High School in Karlsruhe (which is quoted in full in the report).

The report itself is brought to a conclusion by an expression of the hope that classes covering the whole of the gas industry will soon be instituted in Nuremberg, Munich, Berlin, and Breslau, for the Commission feels very strongly that the instruction so given to the minor officials engaged in the manufacture, distribution, and utilization of gas must prove of great benefit to the industry in general, and to the public who consume gas in Germany.

WATER STATISTICS COMMISSION.

The report of the Water Statistics Commission mentions that the usual inquiry circular was sent out for the eighteenth time last year—472 works being applied to, of which it is expected that some 360 will reply. The questions have been amplified by a request for information as to the calorific value of the fuel burnt under the boilers; for its quality varies so largely in different places that the data already calculated to show the amount of work done per unit of fuel consumed are hardly comparable without correction. During the past year a member of the Association made the suggestion that statistics should be compiled to show the number of pipes that have burst; but although the proposal was discussed at a recent meeting, no agreement has been reached by the Commission. It was felt that statistics on the subject of fractures would be very useful; but the results might be improperly used in trade rivalry between cast and wrought iron. Pipes break from a variety of causes. Perhaps the nature of the soil in which they lie has most to do with their failure; but experience also shows that fractures occur more frequently now that towns are piped in every street than they did before. Hence the Commission have felt it preferable to prepare a special sheet of questions relating to pipe failures, and to send it to all the gas-works belonging to the Association, as well as to the water-works, in order that the largest possible quantity of material may be available for study.

WATER-WORKS COMMISSION.

The report of the Commission appointed to study the management of water-works (signed by Herr L. Wellmann, the President) is quite short. In accordance with instructions received from the Association at last year's meeting, a circular has been issued asking for information as to the success or failure of experiments for the discovery of water by means of the divining-rod. A large amount of material has already been collected; but it has been thought better to await the arrival of more before dealing with the subject exhaustively.

A circular has also been sent out to the water-works that hand their annual returns to the Statistics Commission, with the object of ascertaining whether the "Rules for the Erection and Operation of Water-Works" drawn up some time ago by the Imperial Institute of Hygiene have proved satisfactory. The general trend of the answers received is to the effect that the rules are technically and practically good; but further experience is required before a final opinion on the subject can be passed.

MUSEUM COMMISSION.

The last report contained in the pamphlet issued by the German Gas Association for distribution at the Mannheim meeting is that of the Commission appointed at Bremen last year to superintend the due representation of the gas industry at the German Museum provisionally installed in the old National Museum and in a military barracks at Munich. The Commission was composed of the President of the Association and Herren Grahn (since deceased), Reese, Söhren, Ries, and Schilling; the latter of whom has already given an account of the exhibits so far received.* As our previous article appears to cover all the ground, it is scarcely necessary to say more on the subject, except to add that the report ends with a classified list of articles which are already, or which it is hoped will soon be, placed by members of the gas and water industries in Germany, on view in the temporary premises at Munich.

* See "JOURNAL," Vol. XCVII., p. 339.

The Yorkshire Junior Gas Association will next Saturday visit Ripon, on their second annual excursion. Under the guidance of Mr. W. T. Lancaster, the Engineer and Manager, the gas-works will be inspected; and the day's programme also includes visits to Ripon Cathedral, Fountains Abbey, &c.

HIGH PRESSURE DISTRIBUTION IN AMERICA.

[COMMUNICATED.]

LESS than five years ago, in the southern part of the State of New Jersey, there were a number of small gas-works, which eked out a precarious living for the stockholders and gave to several families of workers what Americans call a "cinch." Perhaps one only out of the eight or nine works was run on anything like practical lines—namely, Trenton; and the rest, as indicated above, provided high wages and low labour effort to a number of men. Contrast the state of things then with what obtains now; and it will be seen how, when the effort was needed, men stepped forth of the calibre that has made for America a name that spells initiative energy and success.

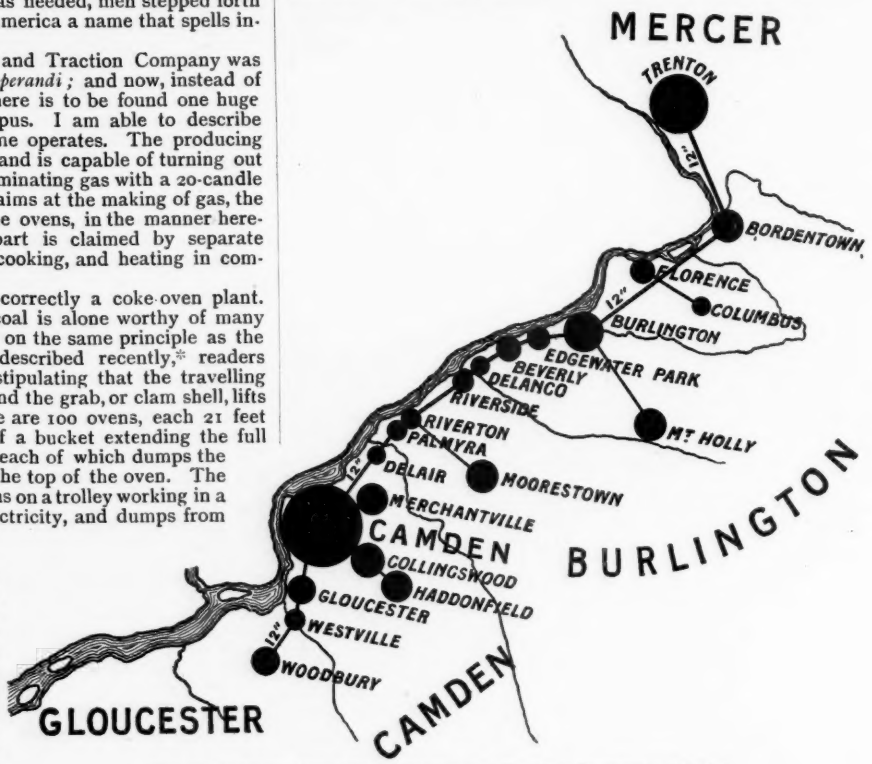
The South Jersey Gas, Electric, and Traction Company was formed to revolutionize the *modus operandi*; and now, instead of a lot of small independent units, there is to be found one huge works with tentacles like an octopus. I am able to describe the unique way in which the scheme operates. The producing plant is located at Camden (N.J.), and is capable of turning out per day 10 million cubic feet of illuminating gas with a 20-candle power value. The plant primarily aims at the making of gas, the bulk of which is used for heating the ovens, in the manner hereafter described; but the chief part is claimed by separate holders, and is used for lighting, cooking, and heating in commercial and domestic districts.

The carbonizing plant is more correctly a coke-oven plant. The machinery for handling the coal is alone worthy of many pages of description; but as it acts on the same principle as the Mariendorf plant illustrated and described recently,* readers can easily fill in the details—only stipulating that the travelling buckets each holds 5 tons of coal, and the grab, or clam shell, lifts that quantity every minute. There are 100 ovens, each 21 feet long. These are filled by means of a bucket extending the full width, and fitted with five outlets, each of which dumps the coal into a separate feed shoot on the top of the oven. The bucket, or bottom dump hopper, runs on a trolley working in a 16-inch I beam, is traversed by electricity, and dumps from five places simultaneously by actuating one lever.

For working purposes the 100 ovens are divided into four units of 25 ovens each, and each unit is charged once every twenty-four hours, during which time, by means of separate valves and mains, it works eight hours, giving good coal gas equal to 20 candles. It is then bye-passed through a separate main to a small holder of 25,000 cubic feet capacity, which has an outlet to supply the ovens with heating gas—in fact, is used only for that purpose. In practice, one unit is always working on the small reservoir holder, so as to provide heating gas; while the other three are making illuminating gas. By experience it is known when the oven should be cut out from the mains, so that the process of making coke can be continued. In this way the carbon is in a form entirely free from sulphur, tar, and gas; and therefore it is specially suitable for burning in slow-combustion stoves.

A feature of interest locally, during the early days of the plant, was how to dispose of the huge quantity of coke made. In the first year it had to be stacked on spare land, covering 5 acres, to a height of 18 feet, and inability to dispose of the coke made the promoters incline to the belief that commercial success would not attend the plant. However, men like these were not to be baulked. They put down crushing plant and made coke of a size suitable for stoves, and then set to work to advertise it. In less than one summer, the huge pile was reduced to a few tons; and from that time onward it has never been given a chance to accumulate. Railroad tracks have been laid in, and the cars are loaded and drawn out in a continuous stream. Gas was aimed at first. This was followed by coke when the demand grew; and now there is a complete plant for extracting the benzol, after which the tar and pitch, &c., are sold to the refiners.

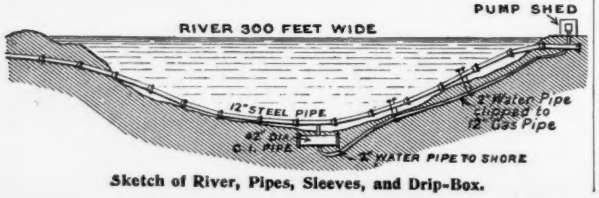
The chief point of interest to English engineers is the method of distribution. On the old system, with separate works, the gas was sent out at ordinary holder pressure; but when catering for the small towns with the main supply from new works a totally different scheme was evolved. The length of ground to be covered is at present 58 miles; but soon the supply pipe or feeder will be extended to Patterson (N.J.); thus making it a total length of 200 miles. On this proposition the Americans had the full benefit of the experience gained by the pioneers of the oil pipe-line layers, and took advantage of it. The details were as follows: It was arranged that the gas should be sent out from the Camden works by means of compressors, working into tanks which gave a pressure, throughout the main feeder, of 40 lbs. per square inch. We publish a map of the system, from which it will be seen that there is a 12-inch main, which is of steel construction and runs from Camden, north to Trenton and south as far as Woodbury. The pipe runs through a number of small towns; but the main pipe simply acts as a carrier, as the gas is run into the existing holders of the old small works, and thence sent out at 4 inches pressure to the consumers. Each holder is worked automatically; a lever being arranged along the side in a similar way to a hydraulic pressure tank, so that when the holder reaches a certain level, catches lift or lower a valve to thus keep a constant maximum and minimum quantity in the holders. The pressure of 40 lbs. is reduced by a regulating governor at the entrance to the holders.



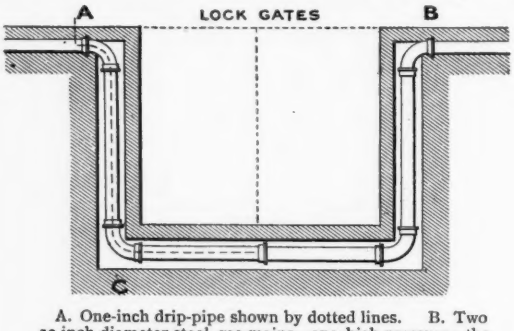
Map of the South Jersey Gas, Electric, and Traction Company's District.

To afford some idea of what can be done with gas supplied through a steel main under pressure, we give one or two particular instances; the first being Mount Holly, which had a population of about 8000 people and is about 8 miles from the main pipe. The consumption of 90,000 cubic feet per day is sent through a 1½-inch diameter pipe, at a pressure of 40 lbs. per square inch. Moorestown, 6 miles from the trunk line, used 30,000 cubic feet per day; and this was sent through a 1-inch diameter pipe. Both of these places had a relief holder; but in the case of Columbus, with an output of 50,000 cubic feet passed through a 1½-inch diameter pipe, there was not this convenience for reducing the pressure in bulk. A separate governor was therefore put in to the inlet of the town supply pipe, which was 5 miles long and composed of 6-inch, 5-inch, and 3-inch pipe. The town of Delair had 3 miles of 1-inch pipe. A remarkable thing in this town is that, with 120 houses, every one had the gas laid on; and

* See "JOURNAL," Vol. XCVIII., p. 220.



Sketch of River, Pipes, Sleeves, and Drip-Box.



A. One-inch drip-pipe shown by dotted lines. B. Two 12-inch diameter steel gas-mains—one high-pressure; the other low-pressure. C. Tunnel four feet below water.

Crossing 50 Feet Wide Creek at Camden.

as the town pipe was carrying full pressure, each house had a separate governor. In a similar way, farmers all along the line were canvassed, and, without much urging, put in a supply, which was also, of course, separately governed to reduce pressure.

Reference has been made to the following of oil-pipe layers in the methods here adopted; and when it is said that the 58 miles of 12-inch main were laid in 58 days, it may be inferred that there was some hustling going on—in fact, the Superintendent, Mr. Andrew Manthorne, practically lived in an automobile so as to get about over the line quickly. His plan was to start two gangs of men at adjacent towns, working south and north till they met approximately midway. Each gang consisted of six men, with a team of horses with a plough, which cut up the hard surface. Following this were a ditching plough and diggers. Where the surface of the road was very hard, a traction-engine was used to cut it with the aid of a steel plough.

Great difficulties were encountered, but were all overcome. Some of the tasks tackled by Mr. Manthorne may be named. At one part of the line a river 300 feet wide had to be crossed. Two scows, or shallow barges, were hired and placed in position on the water, set 4 feet apart; and the space between them planked over so as to make a working platform on which the pipe from the shore rested. A new length of pipe was then sighted by the "stabber," who took his line of the pipe from behind the "jack" on which the already secured pipe rested. The main "jack" (in the form of a tripod, with one vertical leg and one inclined, and fitted with rests) held the end of the loose pipe; and when the sight was taken, the helpers on each side of the pipe applied the tongs and started the thread in action. When this length was fixed, the tug slowly pulled the scows away from the bank until the end of the pipe was in position for taking the next length. By working in this manner, the 12-inch pipe was screwed together laid along the bed of the river, 24 feet deep by 300 feet wide. The time taken was 2 hours 40 minutes—truly a remarkable achievement, but authenticated. For keeping the gas-pipe in position, sinkers were used. These consisted of castings made in halves, tightly bolted together and designed to clip the pipe; one being placed at every coupling. Each of the sinkers weighed 1100 lbs., was made in the form of a sleeve, and fitted round the coupling. Thus all strain was taken off the pipe coupling.

Not the less wonderful was the placing of a drip for this pipe right in the middle of the span across the river. The drip consisted of a 42-inch diameter cast-iron flanged pipe or cylinder about 10 feet long, laid under the 12-inch gas-pipe and connected thereto by means of a 3-inch pipe, which allowed all liquids that condensed or gathered in the gas-pipe to fall into the cast-iron cylinder below. To the underside of this, again, there was attached a 2-inch screwed pipe, which, by means of an elbow, made the water drain pipe take the same curve as the 12-inch gas-pipe; clips being bolted to the latter and made to carry the 2-inch pipe. This drip was fixed and laid after the gas-pipe was in position; and the indefatigable Superintendent was, on this occasion at least, forced to quit his inspecting automobile to don the diver's dress, for the purpose of going over the joints to see that a sound job had been made. That this desired end was gained is proved by the fact that in two years the drip yielded not more than six barrels of water. For sinking the drip-pipe a total weight of 2 tons was used in the form of rails laid on each side of the pipe, on top of the flange of the clips, and above the rails pig iron was placed to keep the whole securely in place.

In Camden, a small creek 50 feet wide had to be crossed. Permission could not be obtained to cross this except under the abutments of a drawbridge belonging to the lock gates. The pipe at this point was also 12 inches diameter; and the authorities insisted that it be sunk 4 feet below the river bed. This was accomplished by divers; and, in addition to the high-pressure line, it was necessary to lay alongside a second 12-inch pipe, which was needed for supplying gas, under ordinary holder pressure, to the community in its vicinity. A tunnel was built; and after the pipes had been screwed together on the bank, they were hauled through this tunnel by manual labour. The dips in this case were differently constructed; the water-pipe being fixed inside each 12-inch gas-pipe, and carried thus to the bank, where proper connections were made to bring the 1-inch water-pipes through the gas-pipe, so that they could be pumped.

It would be thought that natural difficulties abounded on a job of this magnitude—sufficient to tax the resources of any man; but over and above these the art of man invented others, which, if not equal to those naturally found, were more aggravatingly tiresome. On another creek, where a branch pipe line crossed, the neighbourhood sheltered some evilly disposed persons who had a natural, or unnatural, grudge against the Gas Company. This was manifested in a marked and unpleasant degree in the following manner: After the pipe was laid, these schemers took advantage of a dark night and put into use a petrol launch, which they brought into position approximately above the pipe, and then dropped a drag anchor. Full speed ahead was signalled; and after a little trouble (so it is assumed) the pipe was torn in two. The damage was traced by known means, and the pipe was repaired, only to be subsequently broken by a similar contrivance. On this occasion, however, Mr. Manthorne discovered the villainy. The repairs were effected, and the pipe built in a tunnel underneath the river bed; so that the old trick, if tried again, would prove abortive.

As an item of interest, one may tell how, in a usual American manner, the pioneers of this scheme of gas making and distribution went ahead even quicker than their scheme. In other words, the Superintendent had his pipe-line laid and all ready for work long before the contractors for the coke-gas ovens were ready to supply the illuminating agent. The old works at Trenton were kept in good shape ready to supply gas in case difficulty was met with on the new plant; so he made gas in his old benches and on the water-gas sets, and ran connections to the high-pressure line. Such a thing had not been contemplated in designing the scheme of work. There were therefore no pumps or compressors to force the gas through. Nothing daunted, the Superintendent decided to try what an ordinary exhauster would do; and he coupled up the one generally in use at the gas-works. By dint of circumstances, once he had this started, in a sort of inquisitive quasi-experimental way, he had to keep the thing going for many months. But he only had a No. 6 Roots' blower for his compressor; and this was driven by the usual engine which is calculated to give about 6 H.P. under ordinary pressure and speed. In consequence, the plant had to run at tremendous speed; and in a very short time the small connecting pipes between the blower and the mains were almost red hot.

The plant described above has now been considerably enlarged, and there is no doubt the scheme, if somewhat unusual, may be regarded as a great success.

UNACCOUNTED-FOR GAS AND THE CONSUMERS' METERS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The Sales of Gas Act, 1859, is approaching its Year of Jubilee, notwithstanding the fact that it was pronounced to be unsatisfactory at the time of its inception. Apart from its other defects, sufficient attention does not appear to have been directed towards its relations with unaccounted-for gas, and to the serious loss which it entails upon gas companies. It is the object of the following remarks to show that this relation is more important than is generally supposed, and that there is good reason for believing that the consumer's meter is the largest factor of all that are concerned in the troublesome question of unaccounted-for gas. The practice of stating total loss as a percentage instead of as concrete figures is responsible for concealing and diverting attention from the enormous quantity of gas that is so disposed of. A loss of 10 per cent. in a one hundred million district may pass without attracting attention. But put it at 10 million cubic feet, and the very least will be an expression of wonder as to where on earth, or under the earth, it can all go to. Turning to the parliamentary returns for the years 1905 and 1906, we find the following figures:

1905.		
Total gas made	168,647,676,000	cubic feet
,, ,, sold	155,579,725,000	,, ,,
	13,067,951,000	,, ,,
Allow 2 per cent. used on works, &c.	3,372,953,000	,, ,,
Difference	9,694,998,000	,, ,,

Equivalent to 5·75 per cent. of the total make.

1906.		
Total gas made	174,904,791,000	cubic feet
,, ,, sold	161,407,725,000	,, ,,
	13,497,066,000	,, ,,
Allow 2 per cent.	3,498,095,000	,, ,,
Difference	9,998,971,000	,, ,,

Equivalent to 5·71 per cent. of the total make.

In the early days of gaslighting, the unaccounted-for item was accepted as a matter of course, and passed over without question, as being due to leakage or condensation. Later on, however, it became evident that the deficiency was a much larger quantity than could reasonably be supposed to escape and be diffused in the atmosphere without creating great inconvenience, not to say risk of danger; and various ways of accounting for it have been brought forward from time to time, as the common-sense conclusion is that the real loss by leakage can only be a small proportion of the quantity above named.

Among the points that have been fully investigated is the difference between the temperature at which the gas is registered at the station meter, and the average temperature at the consumer's meter, not overlooking the fact that some 30 per cent. of the total annual consumption is taken during the months of December and January, when the atmospheric temperature is at the lowest. A second is the loss on the public lighting due to more gas being really used than appears on the rental books. A third is that due to condensation of liquids; the probability being that the larger proportion of every gallon of water or oil pumped from the drip boxes, was measured at the station meter in the form of vapour. A fourth is the loss of gas when the mains or services are opened or disconnected for making up new connections, for repairs, or for clearing deposits of naphthalene. A fifth is the actual loss by leakage through flaws or cracks in the distributing pipes. A sixth is the gas used at the works and offices—as a rule not metered. The first could be disposed of by correcting

at the station meter—not to the stereotyped 60° Fahr., but to some monthly average, approximating as nearly as possible to the average ground temperature of the district. The second, fourth and fifth are directly subject to the control of the management. No. 6 can be ascertained by the use of meters; the 2 per cent. allowed for use on works is sufficient to include the loss under No. 4; while No. 2 need not, and should not, be an appreciable quantity. Factors Nos. 1, 3, and 5, together with No. 7, the loss by the meters, are therefore chiefly concerned in making up the annual loss of about 10,000 million cubic feet.

The problem is complicated by the fact that many of the items just enumerated do not admit of accurate measurement. Nos. 1 and 3 can be defined to some extent by the aid of available statistics or by direct experiments. As regards Nos. 2, 4, 5, and 6, we may claim that, in the average gas undertaking, no negligence in respect to them is allowed, but that the staff are kept fully alive to the importance of locating and repairing any source of leakage. We must also remember that the average supply pressure over the whole district, and at the inlet of the meters, has practically doubled within the last thirty years; and another source of loss that acquires increased importance year by year, with the continual growth of modern civilization and refinement, is that due to injury or interference with the distributing pipes, inflicted by other parties making use of the subsoil. When there was only the gas-main on one side of the road, the water-main on the other, and the sewer in the middle, each agent had a territory to itself, and enjoyed immunity from outside interference. But now we find all the chief thoroughfares in our large cities used for anything between twelve and twenty distinct lines or conduits; and this happy condition no longer applies.

Although so much has been written and said about unaccounted-for gas, but little allusion has been made to the portion with which the meter is concerned; and the question has never been specially investigated. We may divide the subject into illegal losses, for which the company have a remedy at law, and legal losses, for which they have no remedy. The purchaser usually claims to be entitled to "the turn of the scale;" but it is understood that the turn is a mere trifle—possibly a fraction of 1 per cent. No one would claim a turn of $\frac{1}{4}$ or $\frac{1}{2}$ oz. to 1 lb.; yet I venture to think that gas companies have to give even a larger proportion, and that the limits of legal error are very much more than a trifling quantity. The illegal losses refer to actual dishonesty, either by the direct process of making a bye-pass connection round the meter, thus obtaining gas that does not go through the meter at all, or by the indirect, and in a legal sense safer, means of retaining a slow meter in use, and leaving the gas company to find it out as best they can. Dry meters are now generally used; and we know they are apt in course of time to pass unregistered gas by reason of leakage at the valves. We know also that prevailing ideas, even among respectable consumers, are very loose.

Gas companies are occasionally held up to the public as not without some dealings in ways that are dark; but any experienced inspector could show up the other side of the shield by means of examples that come to his notice every quarter, of customers whose bills have gradually fallen to one-half or less, but who consider themselves justified in accepting the obviously low and incorrect account so long as the gas company raise no objection, if they do not deliberately fence with and evade any direct inquiry. He could tell how extremely rare—so rare as to excite comment in the office—it is for an account to be returned as not being sufficient. Very often attention is directed to the fact that a customer who habitually appears on the late list at the end of the quarter, makes an exception by paying up promptly. Under modern conditions accounts are apt to fluctuate from year to year, and it is more difficult for the gas companies to check the accuracy of accounts by comparisons with previous years. In the old times, the consumption was fairly regular from year to year; and therefore calling over the accounts with the corresponding quarter of the previous year was a useful check against slow or leaky meters. But now there are all sorts of variations. People substitute incandescent burners for flat-flames, or perhaps try some other agent for lighting, or adopt cookers, gas-fires, technical appliances, &c.; and the last two named are used according to the prevailing temperature or to the condition of trade. Possibly the strain thrown on the meter by suddenly turning on or turning off large burners is no assistance towards maintaining the soundness of the valves; and it is now very much more difficult to detect slow meters.

Very often the circumstances are such that the consumer himself cannot judge how far his account may be correct, or how much of a reduction in the bill may be due (say) to the adoption of electricity for a portion of the lighting, or to slowing-down of the meter. Then the introduction of slot meters tends to increase the loss in two ways. By diminishing the average consumption per meter, it tends to increase the chances of error. The average consumption per ordinary meter is in the neighbourhood of 40,000 cubic feet per annum; but that of the slot meter is less than half—say, about 15,000 feet. This means 66 meters per million cubic feet sold per annum, instead of 25. There is also a new feature introduced in the shape of the shut-off valve. Of course, leakage by this means would be shown on the working index; but it is exceedingly difficult, and in some cases impossible, to recover anything extra or in addition to the coins that are put in the slot. The writer, like many others, anticipated that the effect of the introduction of slot meters would be an appreciable increase in the unaccounted-for item. But it is only fair to the makers of slot meters to add that this expectation has not been realized in practice; and this fact is a high compliment to the accuracy of their machinery. The slot-meter consumer is under closer supervision than the ordinary; and the conditions of his consumption are within the personal ken of the officers of the company to an extent that does not attain in ordinary meters. Yet the general experience is that there are far less cases of "slows" in the slot than in the ordinary meter department.

We must accept a certain amount of loss due to intentional dishonesty, or to *bonâ fide* oversight, as being unavoidable in the ordinary course of things. But the next question is the amount of loss that may come within the limits of legal error, or, in other words, the "turn of the scale." The Sales of Gas Act provides certain securities towards the accurate registration of meters; but its regulations never were sufficient or satisfactory, and tend to become less so every year. They show the behaviour of the instrument under certain limited conditions that rarely obtain in practice, and do not fairly indicate the average working condition. No meter is worked under constant conditions as to pressure or as to quantity passed, but under a range of pressures extending at times over several inches of water, and from any quantity commencing at the point where the meter begins to register up to the maximum that will pass through it. It may therefore be questioned whether a single test at one fixed pressure gives more than an indirect indication of the action under changing conditions of pressure and consumption, and the rapid variations due to the turning on or off of large burners.

The tests that are applied to the millions of meters in actual use are comprised in the following few words (see Sales of Gas Act, 1859, Section XIII.):—

> Firstly the meter should be tested for soundness or leakage only, not for percentage of error, when fixed on a horizontal base, and with gas under a pressure equal to a column of water 3 inches high with a light or lights consuming not more than one-twentieth part of its measuring capacity per hour marked thereon, nor less than half a cubic foot per hour for all meters of a measuring capacity not exceeding 100 cubic feet per hour, and not more than one-fortieth part for meters of greater measuring capacity. All meters found to work under such test should be deemed sound meters; and any meter found not to work under such test should not be stamped.
>
> The meter to be tested for percentage of error should be fixed on a horizontal base, and should be tested at a pressure equal to a column of water five-tenths of an inch high and passing the quantity which should be marked thereon as its measuring capacity per hour; and the water used in such testing, and the air of the room in which such testing should be made, should be as nearly as practicable of the same temperature as the gas or air passed through the meter.

Section XII. fixes the limit of error at 2 per cent. in favour of the seller, or 3 per cent. against him.

These clauses represent the conditions defining a legally correct meter, and especially when we remember that meters in the neighbourhood of the gas-works or in situations of high altitude may be worked under an inlet pressure of 6 inches or more, it is obvious that a legally correct meter may be far from being an actual just measure.

As an illustration, take a size that is most generally used—say, a 10-light meter having a nominal or marked capacity of 60 cubic feet per hour. The meter can be tested for soundness while passing 3 cubic feet per hour. The instrument would pass the soundness test if it only indicated one-third of this quantity, and passed the remainder unregistered. So it is passed for the second test, and may be assumed to really register accurately. But the 2 cubic feet lost or passed unregistered at 30-10ths would become less than one cubic foot at 5-10ths, and would therefore figure as a small percentage error—too small to lead to the rejection of the meter. But the effect of a loss in the form of unregistered gas under the soundness test is far more important, in fairness to the seller, than a percentage slow under the second test—in fact, a gas company would act wisely in preferring a sound meter 5 per cent. slow to the above. In the case of a slow meter, the actual loss can be readily defined. But with a meter passing unregistered gas, the loss is a constant first charge so long as the meter is in use and passing sufficient gas to cover or exceed the defect. It is by no means unreasonable to suppose that the meter above instanced may be used to supply a number of incandescent bye-pass burners, and that the flash-lights are going for the whole of the time, day or night, that the burners are not in use. The annual consumption may be taken for the purpose of our argument at 50,000 cubic feet. A meter passing no unregistered gas, but 5 per cent. slow, would register 47,500 cubic feet, and the loss to the seller would be 2500 cubic feet; but the correct meter passing 2 cubic feet unregistered, would only indicate about 33,000 feet, and the loss would be 17,000 feet. If the meter was worked, as many meters are, at a point appreciably above 30-10ths pressure, the loss would be even greater. The common use of pilot or flash lights, and the usual practice of leaving the meter continually under pressure—the old-fashioned custom of turning the gas off at night becoming now untenable—have an important bearing in this connection.

The Sales of Gas Act does a great injustice to the seller in not attaching sufficient importance to the difference between passing gas unregistered, and registering slow, as illustrated in the above example. The conditions may have been as stringent as was practicable with meters as made in 1860; but modern-made meters would pass much more rigorous tests, and there is also no reason why the margin allowed against the seller should not

be reduced. A fixed and reasonably low quantity should be substituted for "anything less than 5 per cent." allowed by the Act as unregistered gas, and the margin in favour of the buyer should be reduced to ½ or even to ¼ per cent. It is evident that, unless a large proportion of the meters in actual use would satisfactorily pass very much more rigorous tests than those prescribed by the Act, the quantity of gas above named as unaccounted for would be very substantially exceeded.

As a means of affording some indication of the actual working of the Act in practice, I will take the certificates obtained from the official inspectors over a period of six years, in a district comprising some 1600 dry meters. These include the whole of the meters disputed by the consumers, and also those which are objected to by the company; and it is remarkable that the ideas of the former in respect to presumably fast meters are rarely supported by the official tests, while the sellers' objections are usually sustained. A meter disputed by the consumer is as often correct as "fast;" and this fact shows the need for disseminating sound knowledge on the economical use of gas. Out of a total of 256 meters, 44 were returned as fast, 64 as correct, 8 as slow, 32 as correct and passing unregistered gas, 61 as slow and passing unregistered gas, and 47 as stopped, and therefore not admitting of any test. There is no evidence that the size of a meter has any connection with its accuracy; the various sizes being fairly well represented in all classes.

In respect to the six classes enumerated, the following remarks may be added:—

I.—44 fast meters. These range from 2·46 up to 9·39 per cent. fast, and only 9 exceed 5 per cent. The average over the whole is 4·25 per cent.

II.—64 correct meters. These, according to the terms of the Act, are within the limits of 2 per cent. fast and 3 per cent. slow. It may therefore be presumed that the average in this class would be 0·5 per cent. against the seller.

III.—8 slow meters. These exhibit a wider range than Class I., and extend up to 20 per cent., the average being about 10 per cent.

IV.—32 correct, but passing unregistered gas. With regard to the first part, the same remark applies as in the case of Class II. No further remark being made as to unregistered gas, it may be taken as a comparatively small quantity.

V.—61 slow and also passing unregistered gas. The results in this class are so interesting in connection with our subject that the remarks on each are reproduced in full. It will be seen that they range from 3·22 per cent. up to over 40 per cent. slow, and also that the gas passed unregistered, where stated, is a very appreciable quantity, usually running into two figures.

VI.—47 stopped meters. In some cases these stopped suddenly, but in the majority they gradually slowed down over two to six quarters. So that although an estimated charge was put in for the time over which they were supposed to be stopped, they represent a substantial loss to the seller.

Per Cent.
Slow.

3·22 not to register under 6 feet per hour.
3·29 " " " "
3·85 " " 12 " "
4·76 passing 9 feet per hour unregistered gas at 30-10ths pressure.
4·94 " 12 " " " " " "
5·36 not to register under 6 feet per hour.
5·48 passing unregistered gas 18 feet per hour at 30-10ths pressure.
5·66 " " " 12 " " " "
6·98 " " " 5 " " " "
7·24 not to register under 14 feet per hour and leaks unregistered gas at index.
8·26 passing 6 feet per hour unregistered gas at 30-10ths pressure.
8·68 not to register under 16 feet per hour.
8·82 " " 4 " "
9·09 " " 24 " "
9·09 " " 18 " "
9·09 " " 18 " "
9·26 " " 20 " " leaks at index.
9·67 noisy in working.
10·39 not to register under 12 feet per hour.
10·45 " " 9 " "
11·11 passing unregistered gas 5 feet per hour at 30-10ths pressure.
11·50 not to register under 16 feet per hour.
11·50 passing 9 feet per hour unregistered gas at 30-10ths pressure.
11·89 " " " " " " " "
12·13 " 24 " " " " " "
12·28 " " " " " " " "
12·59 will not register under 20 feet per hour.
12·66 passing unregistered gas 5 feet per hour at 30-10ths pressure.
13·04 " " " 10 " " " "
13·04 " " " " " " " "
13·42 " " " 12 " " " "
14·38 " " " 6 " " " "
15·97 not to register under 14 feet per hour.
16·67 " " 22 " "
16·67 will not register under 22 feet per hour.
17·90 passing 20 feet per hour unregistered gas at 30-10ths.
18·03 " 30 " " "
18·17 " 15 " " "
19·14 will not register under 14 feet per hour.
20·00 " " 14 "
20·63 passing 24 feet per hour unregistered gas at 30-10ths and leaks at index.
20·89 will not register under 36 feet per hour.
21·14 passing 24 feet per hour unregistered gas at 30-10ths.
22·48 " 20 " " "
23·08 " 17 " " "
24·01 " 26 " " "
24·23 " 7 " " "
26·04 " 16 " " "
27·27 passing 12 feet per hour unregistered gas. Leaky at index.
28·70 " 30 " " "
28·23 will not register under 42 feet per hour.
28·93 " " 12 "
28·57 " " 10 "
29·82 passing 8 feet per hour unregistered gas at 30-10ths.
33·70 will not register under 60 feet per hour.
33·68 " " 18 "
36·86 lights defective. No passage at 5-10ths.
37·86 passing 70 feet per hour unregistered gas at 30-10ths.
43·18 " 45 " " "
All passes gas, but not to register.
All " " "

It will be seen that the loss to the consumer is a small quantity. Out of 256 meters tested, only 44 were against the consumer, and only 9 exceeded 5 per cent. It could not by any possibility exceed the figure stated, and might in practice be very much less. A meter 6 per cent. fast and passing 2 per cent. unregistered would in practice be very different from 4 per cent. fast, as shown in the foregoing example. This consideration applies to all the classes. But with the exception of class I. the remainder are all against the seller, and IV., V., and VI. are so to an indefinite extent. It will be noted that 140 (more than half the total) pass unregistered gas. These did not probably deviate from the paths of virtue by one decided step, but gradually got out of order—making a small beginning and going from bad to worse. But even if the important item of unregistered gas is rejected, the percentage of the "slows" is so much greater than than of the "fasts," as to warrant the claim that, instead of the pendulum receiving a definite swing in favour of the buyer by 1 per cent. difference on correct meters, the seller is entitled to have the advantage of the turn of the scale by reason of the inherent tendency of the meter to go against him.

I may be reminded that the sellers have their remedy in respect to slow meters. But I have purposely avoided this contention, as it is evidently unreasonable to add to the numerous responsibilities of gas suppliers the duty of recovering losses for slow registration. Nothing can be done in respect to the item of unregistered gas; and the "slows" are a very doubtful asset. In many, perhaps in the majority of cases, it is absolutely impossible to recover anything like a fair equivalent for them.

In conclusion, I venture to claim that the above statements, though admittedly indefinite and incomplete, are conclusive in respect to the need for an entire change in regard to the Sales of Gas Act, 1859, Clauses XII. and XIII., and that such a change is simply a matter of justice to the sellers of gas. I would suggest that the Committee of the Council of the Gas Institute who have this matter in hand should not fail to regard it from the point of view above suggested—its connection with unaccounted-for gas. The lines of amendment might take the form of striking off the percentage allowed in favour of the buyer; but the special point is that they should give much more attention to ascertaining the percentage of unregistered gas, and that it should be even more rigorously limited than the percentage of error.

A remarkable well exists near New Burlington (Ohio). It is fitted with two pumps—one furnishing fresh water, and the other water having such a high amount of mineral salts that it is almost brine. Two water-bearing beds confined between layers of limestone occur at this point, the upper carrying fresh and the lower salt water. The pipe of the fresh-water pump is only 16 feet long; that of the salt-water pump is 35 feet. The brine, being heavier than the fresh water, does not mix with it, but remains at the bottom of the well, and the longer pipe consequently draws only the salt water.

Referring to the increase in the price of gas in London, the "Engineer" last Friday said: "It was only to be expected that, the price of coal continuing to increase, gas companies should raise the price of gas. A number of circumstances has caused coal to be so expensive. There was a great outcry when the export tax of 1s. per ton was imposed; and great jubilation on the part of the coalowners greeted its repeal. But the price of coal did not go down. On the contrary, for various causes, it went up. In some cases it has risen by 2s. 6d. per ton. Everyone is suffering; and among the chief victims are the railways and the gas companies. With both of these the results are the same—dividends are less. But the railways cannot charge more for carrying people and goods—or, perhaps, we should say, do not do so—while the gas companies can increase the price of their illuminant. They do it, however, only under penalty; for if they raise the price of gas they must proportionately lower the amounts distributed in dividends. The actual ratio between the increase of price charged and the decrease in dividends—and *vice versâ*—is governed by statute, and it may be regarded as therefore to the advantage of the companies to keep the price as low as possible. Sir George Livesey, not only in the circular lately issued by the South Metropolitan Company, but also at the recent Engineering Conference, remarked upon this matter, and also upon the fact that gas companies are much more heavily rated now than was formerly the case."

THE TRUE SCOPE OF A GAS-WORKS.

As briefly mentioned in the "JOURNAL" last week (p. 20), Herr Kobbert, the Manager of the Gas-Works at Königsberg, read a paper before the Mannheim meeting of the German Gas Association, of which we now give a full abstract.

THE POSSIBLE DEMAND FOR GAS.

Herr Kobbert's main argument is that a gas-works of to-day by no means fulfils the functions it ought. In somewhat magniloquent language, a gas-works is usually termed a central station for the development of light and heat. To some extent it does behave as the general establishment where the artificial light required in a town is generated; but the works is very far from occupying a similar position in respect of artificial heat. Even where electricity is employed as the actual illuminating agent, the current ought really to be a product of the gas maker; for Herr Kobbert's ideal is that no coal should be burnt for any purpose whatever within the confines of a large town or its suburbs—the whole of the solid fuel required either to make gas or to evolve heat for every domestic and industrial purpose, including the generation of electricity, being carbonized or gasified in the perfect gas-works of the future.

To show how very greatly the quantity of gas consumed at the present day is below what it should be, the author quotes the conditions obtaining in a certain German town which in 1905 had 220,000 inhabitants. In this town the total make of gas for the year mentioned was roughly 500 million cubic feet, about 40 per cent.—*i.e.*, 200 millions—being used for boiling and cooking purposes. The town contained approximately 40,000 distinct houses and flats; 15 per cent. of the families occupying three rooms, 10 per cent. more than three rooms, and 75 per cent. less than three rooms. Now, as is well known a household of five persons living in three rooms should, on an average, consume about 53 feet of gas in the kitchen per day—a volume which, allowing for the summer season, wastefulness, &c., should amount to a consumption of 550 million feet per year for cooking only in a town of the size stated. Though the actual consumption for cooking was only 200 millions, the consumption for this purpose was, in comparison with other towns, very satisfactory. Hence the demand for cooking gas is capable of being more than doubled.

Similarly, it is well recognized that the consumption of gas in a flat of four rooms, without allowing for waste, is about 45,000 feet per year, which, at the price of 3s. 4d. per 1000 feet, is a little more than is commonly paid by German people living in such circumstances as their contribution towards the general expense of heating. If, now, it were possible to sell gas of 450 B.Th.U. per foot at a price of about 7d. or 10d. per 1000 feet in the manner to be suggested later on, the consumption would be increased in a town containing 40,000 separate occupied premises and 66,000 rooms altogether on the following scale: In 27,000 rooms of the occupied premises containing three or more rooms each, the consumption would be 300 million feet, which would represent an increased demand upon the gas-works of $1\frac{1}{2}$ million feet per day during 200 days of the year, and a maximum daily demand of $2\frac{3}{4}$ millions. Thus a town which at the present time is consuming 200 million feet of gas for cooking and room-warming purposes ought to consume $550 - 200 + 300 = 650$ millions—a figure which notably exceeds its ordinary consumption for every purpose at the present day.

In a town of the size under review each individual dwelling contains on an average 1·7 rooms, consuming about 3300 lbs. of fuel a year; hence, the consumption per four-roomed house should be about 7700 lbs. If the gas has a calorific value of about 560 B.Th.U. per cubic foot and the efficiency of the stoves is 80 per cent., while the calorific power of the coal used for heating purposes is 11,700 B.Th.U. per lb., the ratio of the heat developed by combustion to that rendered actually useful is about 4·4 to 1—that is to say, the efficiency of the ordinary solid fuel is only 18 per cent. Such a low efficiency in a town of the size considered represents a loss of about £50,000; the total consumption of solid fuel, including that burned by small tradesmen and in public schools and offices, &c., being altogether approximately 90,000 tons per annum. Finally, a town of the 220,000 inhabitants under discussion should burn for all purposes (say) 100,000 tons of coal, &c., per year, even if it is not a place where many manufacturing operations are performed; and if the appliances used for heating by means of gas have an efficiency of about 80 per cent., the total demand for heating gas should reach 3700 million cubic feet per annum, which, with the 500 millions now consumed in the development of light, should render the total consumption 4200 million cubic feet. In other words, the consumption per head should increase from 2200 to 19,500 feet.

PRESENT METHODS OF MAKING GAS.

It has now to be considered how such large quantities of gas could best be made. Under present conditions the smallest gas-works which can be profitable is one having an annual make of about $5\frac{1}{4}$ million cubic feet; but the largest factory it is possible to manage is hardly capable of definition. The methods that are employed for making gas on a very large scale are defective, inasmuch as the plant is scarcely modified from its standard form whether each unit is to treat $\frac{1}{2}$ ton or 500 tons. Thus the buildings and the apparatus itself increase in expense almost in proportion to the magnitude of the undertaking. At present a gas-works has to be erected in a spirit of compromise, so as equally well to suit the conditions prevailing in the summer and those in the winter. If the consumption of gas could be stimulated on the lines already described, and the demand for heating gas greatly increased, variations in the time of day would affect the process of manufacture much less than they do now; but alterations in the time of the year would become more noticeable. Papers have already been read at the Mannheim meeting pointing out the advantages of inclined and vertical retorts, and at the Dublin meeting of the British Institution reference was made to the use of coke-ovens in gas-works. Mr. Schlicht, too, has described the employment of recovery coke-ovens for the production of gas. But his idea has been to improve the atmospheric conditions of a city by increasing the consumption of coke. This scheme, according to Herr Kobbert, is not a complete solution of the question, for the latter desires to see the complete abolition of all solid fuel. The present author would accordingly prefer to gasify the whole of his coke, using as the gas-making vessel a vertical coke-oven.

In order to examine the phenomena that would arise if all the demand for artificial light and heat in a town were to be supplied from a gas-works, the annexed calculations may be made. If it is assumed that the calorific power of a flaming coal is 12,600 B.Th.U. per lb., and its efficiency is 60 per cent., if the calorific value of gas is 450 B.Th.U. per foot and its efficiency 80 per cent., if a little under 11,000 feet of gas are made per ton of coal, the production of heat in the form of gas which should replace the solid fuel now consumed would require the carbonization of about five times the quantity of coal now burnt and about $2\frac{1}{2}$ times that of the saleable coke. These figures limit the production of gas; for if about $1\frac{3}{4}$ lbs. of light oils, having a calorific value of 17,000 B.Th.U., are obtained per ton of coal, there could be made 25·6 cubic feet of gas having a calorific power of 290 B.Th.U. from each pound of coke; whereas for the production of gas having a calorific power of 450 B.Th.U. it would be necessary to obtain 54·5 cubic feet. Hence it is only possible to lower the calorific value of the gas or to use carburetting materials obtained from sources other than coal. It is difficult to foretell at present what may come of the new experiments upon the manufacture of blue water gas from creosote oils; but the employment of carburetting agents not derived from coal itself is a question having only local and occasional importance. In the town already discussed, there are 39,000 rooms not heated with gas; and they should consume, at the outside, 60,000 tons of coke to warm them. If they were heated by gas, the corresponding amount of coke thrown on the market would be 230,000 tons.

The question of cost remains to be considered. The gradual introduction of machinery into gas-works renders the manufacturing costs more uniform or alters their incidence, but does not greatly reduce them; for the apparatus has inevitably to remain incompletely used for months at a time. If the gas were made in coke-ovens, the engineer's ability to fire them either with coke or with coal gas would help to keep the plant running at uniform speed; while, moreover, the adoption of such large carbonizing units would render the recovery of bye-products more perfect than it is at present, even when many thousand retorts are under fire in the same house. Furthermore, the coke made in ovens could be sold over a larger district than is now possible, because it would be harder. The nitrogen would be more perfectly recovered and the sulphur might be isolated, even on the gas-works. The non-manufacturing costs on a gas-works are very high at the present day. Per unit of gas made, these costs, in a retort-house fitted with inclined retorts carbonizing 15 tons per day and yielding 160,000 cubic feet of gas, stand to the costs of a coke-oven consuming 5·6 tons per twenty-four hours, in the proportion of 5500 to 2000—a proportion which is notably increased by the traditional method in which gas-works are constructed. Finally, the buildings where the gas is purified occupy so much ground as to be extremely expensive.

THE AUTHOR'S PLAN FOR MAKING CHEAP GAS.

All these different sources of additional expense appeared so important that when the gas-works at Königsberg had to be enlarged it was decided not to install any oil carburetting plant for the water gas. By so doing it was found possible to adopt a method of washing the gas which permitted a larger quantity of nitrogen to be recovered, and enabled the existing buildings to be more profitably utilized than would otherwise have been the case, even allowing for the unusually high price demanded for sulphuric acid in the neighbourhood. For example, in a building which, when the apparatus was constructed in the ordinary manner adopted in 1900, was equal to a production of $1\frac{3}{4}$ million feet per day, six washers were erected for the recovery of tar, liquor, cyanogen, and ammonia, capable of treating 4 million per day. Furthermore, the ammonia and the cyanogen could be obtained in a merchantable form, either together or separately, and the building which formerly only sufficed for distilling the ammonia became large enough for the manufacture of ammonium salts. As resulting from the experiments of Dr. Wolffram, Dr. Hurdelbrink, Herr Walter Feld, and the German "Gesellschaft für Kohleverwertung," the method employed for washing the gas is somewhat as follows: Each of the six washers mentioned is a vertical tower divided into numerous superposed chambers fed with liquid from a pipe at the top, which revolves, according to the size of the apparatus, at the speed of from 120 to 180 revolu-

tions per minute, so that the centrifugal force propels the reagent against the sides of the vessel and causes a uniform distribution of fine drops through which the gas passes from below upwards. Without any preliminary cooling, the gas first passes to the tar-washer, the condensed liquid in which causes the tar vapours to separate. It next travels to the second washer, fed with water at from 80° to 100° C., where the ammonia is removed. The third washer is charged with ferrous sulphate for the separation of cyanogen. In order to prevent the absorption of ammonia, lime is added, so that the product is a solution of calcium ferrocyanide. The ammonia washers are charged with a cream of anhydrous gypsum. The carbon dioxide in the gas causes the formation of calcium carbonate, which can be easily removed in filter presses, while the liquid is evaporated to obtain ammonium sulphate. The next washers are employed to remove the sulphur by Feld's wet process [compare "JOURNAL," Vol. XCVIII., p. 85], a tar oil being used by which the sulphurous acid is absorbed. The sulphuretted hydrogen of the gas after the ammonia has been removed reacts with the sulphurous acid to yield free sulphur; and the latter separates on standing.

On a gas-works run on the usual lines, where, owing to the price of sulphuric acid, ammonium sulphate can only be obtained from the cyanogen sludge, the yields of bye-products per metric ton of coal are somewhat as follows: Strong aqueous ammonia 1·27925 kilos., ammonium sulphate 0·15632 kilo., cyanogen filter cake 0·10627 kilo., Prussian blue 0·71689 kilo. (worth, in good average German conditions, 124 pf. altogether); while 0·51067 kilo. of quicklime and 1·7931 kilos. of ferrous sulphate (costing 7·4 pf.) are consumed (showing a net gain of 116·8 pf. per metric ton). In the Feld washer, on the other hand, where the yield of ammonia is not dependent on the temperature of the washing liquid, the amount of ammonium sulphate obtained is 2·2 kilos., and of Prussian blue in the form of calcium ferrocyanide 1·4 kilo., per metric ton (value 254 pf.); whereas the consumption of reagents, allowing for a sufficient excess in each case, is 13·86 kilos. of gypsum, 1·4938 kilos. of ferrous sulphate, and 1·07421 kilos. of quicklime (costing 38·5 pf.). Thus per metric ton of coal the money value of the bye-products recovered is 215·5 pf., instead of 116·8 pf., showing an increase of 98·7 pf. For a consumption of 40,000 tons of coal, this represents an increase in revenue of some £1970 over and above the avoidance of the depreciation and interest on a second condensing and washer house, which would cost about £1900. In building a new works altogether, considerably greater economy could be effected. For instance, a condenser and washer house, with all necessary accessories for an annual make of about 700 million cubic feet could be erected for about £23,000; whereas the same structure would hold a Feld plant of treble the capacity, and would cost about £42,000—the interest and depreciation on the latter per unit of gas being a little more than half that of the former. In fact, the author considers that a coke-oven factory having an annual capacity of 5000 million feet could be erected at such a price that, allowing for a 4 per cent. sinking fund on the capital and 5 per cent. depreciation, gas of 450 B.Th.U. per cubic foot could profitably be sold at 7d. or 8d. per 1000 cubic feet—practically the price at which heat can be obtained from solid fuel to-day.

Herr Kobbert concludes his paper by a confident statement that his foregoing estimates are not empty visions, but are the result of careful calculations and actual experience.

The Next Examinations in "Gas Manufacture."

We have received from the Superintendent of Technological Examinations of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the ensuing session, containing the regulations for the examination of candidates in technological subjects. It is notified that next year, as already intimated in the "JOURNAL," separate examinations will be held in "Gas Engineering" and "Gas Supply;" and they will include questions on such subjects as will be found set out on pp. 50-55 of the programme, as well as in the "JOURNAL" for the 4th ult. (p. 650). Lists of books bearing upon the two subjects are given at the end of the proposed questions. The examinations for both grades will be held from 2.30 p.m. to 6.30 p.m., on Saturday, May 9; the Examiners being, as already mentioned in our columns, Mr. A. F. Browne, of Vauxhall, and Mr. J. H. Brearley, of Longwood. Intending candidates may be reminded that the first prize in the Honours grade is £2 given by the Salters' Company and the Institute's silver medal. There are two prizes in the Ordinary grade—viz., the first, of £1, given by the Salters' Company and the Institute's bronze medal; and the second a bronze medal.

At a recent meeting of the Paris Académie des Sciences, a communication on the nature of sulphammonium was submitted by MM. Lebeau and Damoiseau. It was a repetition of the work of Henri Moissan and of Herren Otto Ruff and Geisel. According to "Nature," the latter indicate a reversible reaction between sulphur and ammonia; giving rise to nitrogen sulphide and ammonium sulphide. In the present paper it is shown that if minute precautions are taken to ensure the complete absence of moisture, neither nitrogen sulphide nor ammonium sulphide is formed. The weight of sulphur recovered after evaporation of the liquid ammonia is exactly the original weight; and no trace of sulphuretted hydrogen is given off during the evaporation.

CARBONIZATION OF DURHAM COKING COAL.

At a Meeting of the Newcastle Section of the Society of Chemical Industry early this year, a paper on "The Carbonization of Durham Coking Coal and the Distribution of Nitrogen and Sulphur" was read by Mr. ANDREW SHORT, B.Sc. The text of the paper was given in the "JOURNAL" of the Society for the 15th ult., from which it has been reproduced.

The carbonization of coal by destructive distillation has been the subject of many investigations, both in the laboratory and on a large scale. The following notes refer particularly to the carbonization of Durham coal coked in patent coke-ovens.

In coke-works, the methods are somewhat similar to those adopted in gas-works; the chief difference being a question of the ultimate product. In a patent coke-oven, the quantity of coal dealt with in a charge is much greater, and the time required for carbonization much longer, than in gas-works practice. Hence the conditions required and the products of distillation differ somewhat in the two cases. The temperature of carbonization is probably higher in coke-ovens than in most gas-works; moreover, it is not so easy to prevent the admission of air into a coke-oven as it is with a gas-retort.

The investigations here described were carried out on a battery of patent coke-ovens of the Otto-Hilgenstock type; the plant belonging to the Priestman Collieries, Limited, at Blaydon-on-Tyne. The ovens are rectangular chambers some 33 ft. long, 6 ft. 6 in. high, and from 20 in. to 22 in. wide. They are fired by gas, which is burnt in large bunsen burners, arranged underneath vertical flues. The charge of coal is about 6 tons 15 cwt. The gases are led off by an ascension-pipe into a gas-main, and by means of exhausters are drawn through air and water coolers, and then forced through scrubbers, as is usual in gas-works. The gas is then returned to the ovens, where it is burnt in the flues for the purpose of carrying on the distillation of the coal.

TABLE I.—*Percentage Analysis of Gas at Various Periods of Carbonization.*

—	After 1 Hour.	After 6 Hours.	After 11 Hours.	After 16 Hours.	After 21 Hours.	After 26 Hours.	Later Test. Oven Off Main.
Carbon dioxide	1·4	2·2	1·4	1·0	1·0	1·4	0·8
Unsaturated hydrocarbons	5·6	5·0	3·4	1·4	0·2	0·0	0·0
Oxygen	0·8	0·8	0·7	0·2	0·2	0·4	0·0
Carbon monoxide	5·4	4·9	4·3	4·4	4·6	9·2	5·4
Hydrogen	39·2	44·8	47·9	54·5	62·6	59·2	76·8
Methane	41·1	36·1	34·1	29·8	23·0	4·0	4·5
Nitrogen	6·5	6·2	8·2	8·7	8·4	25·8	12·5

Average Analysis of Gas.

	Per Cent.
Carbon dioxide	1·8
Unsaturated hydrocarbons	3·8
Oxygen	0·6
Carbon monoxide	5·0
Hydrogen	51·5
Methane	28·4
Nitrogen	8·9
	100·0

Calorific value (net), 500 B.Th.U. per cubic foot.

The figures given in Table I. are the results of experiments made with a view to showing some changes taking place during the distillation of coal in such ovens. It will be seen that at the commencement of distillation, when the temperature of the charge is low, the gas given off is rich in illuminants and relatively poor in hydrogen. As coking proceeds, the oven becomes hotter, and the gases suffer by reason of the increase in temperature, and alter gradually in composition. The percentage of hydrogen increases steadily, and methane and olefines decrease in proportion. The tests were taken at intervals of five hours; the gas being drawn off from the ascension-pipe at a point some 2 ft. 6 in. from the base. The analysis of gas at the 26th hour is somewhat interesting, as it shows a decrease in the percentage of hydrogen, and a corresponding increase in carbon monoxide and nitrogen. This is explained by the fact that the ovens are never absolutely air-tight; so that when the volume of gas given off decreases, as it does towards the end of the coking period, there is a slight suction exerted on the oven by the exhausters which draw off the gas. The result is that a little air has been drawn in, and has evidently burnt up part of the hydrogen and the carbon. Thus there is an increase in the proportion of carbon monoxide, and a considerable percentage of nitrogen has been introduced. In order to find the effect of relieving this suction, the same oven was afterwards shut off from the gas-main, and the ascension-pipe cap was removed, so that the gas found its way naturally into the air without any suction being exerted on the oven. A sample of the gas was drawn off; and the analysis is shown in the table. The hydrogen exhibits a great increase, while the proportions of carbon monoxide and nitrogen are considerably diminished. [The evolution of ammonia was shown on a chart, and also the temperature of the gases leaving the oven. The changes were

such as might be expected after studying the changes recorded in Table I.]

It is a well-known fact that ammonia decomposes on heating. This has been illustrated by Lunge, who shows that when ammonia is passed through a tube heated to 600° C. filled with broken porcelain, 34·14 per cent. is decomposed with a slow current of ammonia, and 21·36 per cent. with a rapid current; while at 780° C. the decomposition is complete. Thus it is important that the temperature in the top of the oven should be kept down as far as practicable, and that the gases should be led off as quickly as possible.

In order to see whether a mixture of a large excess of coal gas together with a relatively small quantity of ammonia exercised any protecting influence on the ammonia, I tried the following experiment: A sample of gas, taken from the main, immediately before entering the scrubbers, was drawn through a tube of Jena glass 2 feet long, filled with broken pieces of fire-brick. The tube was heated to a full red heat in an ordinary Erlenmeyer furnace, and the gas was drawn, in a moderate stream, through the red-hot tube, with the following result:—

	Grammes per Cubic Metre.
Ammonia in gas before entering tube	5·26
,, ,, after leaving ,, ...	3·77
Ammonia decomposed	1·49

Thus the ammonia suffered decomposition to the extent of 28·3 per cent.

The decomposition of ammonia in the oven probably takes place in two ways—*viz.*, dissociation into nitrogen and hydrogen, and, by contact with the red-hot coke, production of cyanide of ammonia and evolution of free hydrogen—$2NH_3 + C = NH_4CN + H_2$. Thus we might expect with a higher temperature of carbonization an increase in cyanogen.

TABLE II.—*Variation of Cyanogen in Liquor with Increased Temperature.*

Date.	Gas Pressure.	Ascension Pipe Temperature.	Ammonia in Liquor.	Hydrocyanic Acid in Liquor.	Hydrocyanic Acid per 100 Parts of Ammonia.
1906.	In.	Deg. F.	Grms. per 100 c.c.	Grms. per 100 c.c.	
Sept. 21	1·20	1069	1·26	0·025	1·98
,, 26	1·20	1086	1·41	0·028	1·99
Oct. 3	1·23	1086	1·26	0·029	2·30
,, 16	1·27	1121	1·34	0·035	2·61
,, 23	1·28	1170	1·48	0·032	2·17
Nov. 15	1·27	1165	1·60	0·038	2·37
Dec. 6	1·27	1150	1·59	0·043	2·70
,, 20	1·27	1150	1·50	0·041	2·70
1907.					
Jan. 18	1·26	1200	1·46	0·036	2·46
,, 22	1·27	1210	1·63	0·043	2·64
Feb. 6	1·27	1200	1·56	0·038	2·43
,, 19	1·25	1130	1·51	0·032	2·12
,, 26	1·27	1176	1·69	0·041	2·43
..	..	..	1·48	0·035	..

Table II. shows the variation in cyanides contained in the ammoniacal liquor with increasing gas pressure on the burners; and therefore increased temperature in the oven flues. The table gives the gas pressure, the temperature of gas in the ascension-pipes, and the percentages of ammonia and cyanogen as cyanides in the liquor. As the strength of the liquor varies from day to day, the relative proportion of cyanide to ammonia has been calculated. It will be seen that as the pressure of gas is increased, the temperature of the gases leaving the oven also rises, and an increase in the amount of cyanogen follows. The discrepancies in the table can be explained by the fact that the tests were taken only at intervals. The general trend is, however, shown fairly clearly to be an increase of cyanogen with higher temperature; the cyanide resulting from the decomposition of ammonia.

A comparison of the conditions existing in the various forms of retort used for the distillation of coal affords an interesting study. In the horizontal gas-retort we have a comparatively small D-shaped retort heated all round by the flue gases. The coal is charged into this red-hot retort, and lies in a more or less thin layer on the bottom, leaving a considerable space above it. The retort is cooled somewhat by the coal. As distillation proceeds, the temperature of the retort increases, and the gases coming off come in contact with the hot sides and top of the retort. That decomposition takes place is seen from the thick deposits of carbon on the roof of the retort—this carbon being to a large extent the product of decomposition of hydrocarbons in the gas. Towards the end of the distillation, the charge becomes very hot, and more decomposition takes place—resulting in the production, during the later stages, of a gas low in hydrocarbons and rich in hydrogen (the hydrogen being a result of the decomposition of the hydrocarbons). The ammonia yield also suffers, especially when the temperature of distillation is high, as is the case in most modern gas-works; and the quality of the tar also deteriorates. On the other hand, the charge is worked off more quickly than in a coke-oven.

This decomposition has been fully realized, and attempts have been made to overcome the difficulty by adopting different methods of carbonization. One, and perhaps the most successful from a chemical point of view, is the vertical gas-retort, forms of which are being worked both in this country and on the Continent. This type of retort consists of an upright cylinder into which the coal is charged from the top. The charge practically fills the retort, which is heated from the outside; the heat gradually penetrating to the centre. The gas evidently takes its course up through the comparatively cool core to the top of the retort, where it immediately enters the ascension-pipe at a low temperature, and is drawn off without further contact with the highly-heated sides of the retort, and so is not liable to undergo further decomposition. Bueb, in a description of the vertical gas-retorts of the Dessau type, gives the average yield of ammonia from vertical retorts as 3·11 kilos. per ton of coal, and from ordinary retorts 2·32 kilos.—an increase of 34 per cent. in ammonia yield. He also states that the quality of the tar is greatly improved, as it contains a much larger proportion of benzene and its homologues, is thinner, and practically free from suspended carbon. Besides, the coke produced in the vertical retort is harder than that from horizontal retorts.

In the horizontal coke-oven there is a large rectangular chamber some 33 feet long by 6 ft. 6 in. high and 2 feet wide which is almost completely filled with coal, leaving only a relatively small space at the top for the exit of the gases. Coking proceeds from the sides inwards, and the heat gradually penetrates to the core. This oven would seem to combine some of the features of both vertical and horizontal gas-retorts. For instance, the centre of the charge remains at a comparatively low temperature for the greater part of the coking period, rising at the centre only towards the end of the distillation. The temperature of the flues is at least 2000° Fahr., while that of the gases leaving the oven is only 1060° to 1200° Fahr. It is thus reasonable to suppose that a proportion of the gas rises through the cooler centre core, as is contended to be the case in the vertical retort, especially as the coke in the centre, near the top of the charge, is frequently a little honeycombed, while that on the outside is always hard and dense. The gas must, however, as in the horizontal retort, pass under the hot top of the oven on its way to the ascension-pipe; and if this surface is highly heated, decomposition will take place. The volume of the space above the coal is, however, much smaller, compared with the bulk of the charge, than in the horizontal retort. In any case, the yield of ammonia is very similar to that from a horizontal gas-retort; and the tar is moderately low in free carbon, when compared with that from gas-works, working at high temperatures. A vertical coke-oven, with recovery of bye-products, has recently been patented by Mr. A. O. Jones; and it will be interesting to see, when this oven is in use, whether the improvements obtained by Bueb and others with vertical retorts are repeated with a vertical coke-oven which is similar in principle.

Distribution of Nitrogen.—Figures showing the distribution of nitrogen have been published by various authors, among whom are Foster, Knublauch, and recently M'Leod. Foster's figures relate to English coal, Knublauch's to German, and M'Leod's to Scottish coals.* Some of the data are tabulated below:—

Nitrogen.	Foster.	Knublauch.	M'Leod.
	Per Cent.	Per Cent.	Per Cent.
As ammonia	14·50	12 to 14	17·1
As cyanogen	1·56	2·0	1·2
In the coke	48·68	50·0	58·3
In the tar	35·26	30·0	3·9
In the gas			19·5

The figures given below were obtained from the results of actual working on the large scale in coke-oven practice, and most of them over a considerable period; the object being to obtain results over an extended period rather than from isolated tests or mere laboratory distillations. The following method was adopted: The average percentages of nitrogen were determined in the coal, coke, and tar, in the ammoniacal liquor, and in the end gas after leaving the scrubbers, together with the yields of these various products. The total quantity of coal carbonized during six months was calculated back to dry coal, the average moisture in it being known; and the quantity of coke made was similarly calculated to dry coke. The moisture was determined in each by daily tests. To the coke figure was added the coke breeze and ballast, also calculated to the dry material. This figure for "total coke" worked out at 76·44 per cent. on the dry coal. The yield of tar on dry coal was 4 per cent. The total quantity of ammonium sulphate made, each lot of which was analyzed, was calculated back to ammonia. To this figure was added the ammonia in the spent liquor from the stills; and thus a figure was found for total ammonia in the gas liquor, and calculated back to the percentage yield of ammonia on the dry coal. This figure worked out to 0·288 per cent. From the analysis of the ammoniacal liquor in Tables III. and IV., we get the distribution of nitrogen in it as ammonia, cyanide, and sulphocyanide (any nitrogenous organic bodies contained in the liquor were neglected). Having these proportions, and knowing the percentage of the nitrogen in the coal which is actually obtained from the liquor as ammonia, we can get the relative proportions of the nitrogen yielded as cyanide and sulphocyanide in the liquor. The analysis of the liquor must be performed on the fresh sample, since on keeping the liquor for a time the cyanide disappears, probably reacting with ammonium polysulphide, produced on standing, from the ammonium sul-

* See "JOURNAL," Vol. XCVII., p. 748.

phide, to form ammonium sulphocyanide. For example, a fresh sample of liquor gave 0·042 per cent. of hydrocyanic acid. After seven days the percentage had dropped to 0·027, and after 21 days to 0·009.

TABLE III.—*Analysis of Ammoniacal Liquor.*

	Grammes per 100 c.c.
Ammonia—Free	1·41
,, Fixed	0·11
Total	1·52
Sulphur—	
,, As sulphuretted hydrogen	0·237
,, as sulphocyanides	0·013
,, as thiosulphate and sulphite	0·008
,, as sulphate	0·004
Total	0·262
Carbon dioxide	1·490
Cyanides—	
Ferrocyanides	*nil*
Cyanides (as HCN)	0·0360
Sulphocyanides (as HCN)	0·0119
Chlorides (calculated as HC)	0·1530

TABLE IV.—*Distribution of Nitrogen and Sulphur in Liquor.*

	Per Cent.
Nitrogen—	
,, As ammonia	98·31
,, as cyanides	1·47
,, as sulphocyanides	0·22
	100·00
Sulphur—	
,, As sulphuretted hy hydrogen	90·46
,, as sulphocyanides	4·96
,, as sulphite and thiosulphate	3·05
,, as sulphate	1·53
	100·00

There now remains the nitrogen in the gas. The cyanogen is only partially extracted by the scrubbers. The portion remaining in the gas was estimated by the prussian blue method; the small quantity of residual ammonia in the gas being estimated in the usual way. Assuming that a ton of coals yields 10,000 cubic feet of gas, the percentage of the nitrogen of the coal which remains in the end gas as cyanogen and ammonia can be calculated. The figure 10,000 cubic feet for the yield of gas is assumed, since in coke-works the gas is not measured as it is in gas-works. Table V. gives the various figures for the nitrogen distribution. The difference figure is taken as free nitrogen in the gas. This it is impossible to verify, as under the best working conditions some air is liable to be drawn into the oven.

TABLE V.—*Nitrogen Distribution.*

[The dry coal contains 1·57 per cent. nitrogen.]

—	—	Calc. to Dry Coal.	Total Nitrogen.	Total Nitrogen.
	Per Cent.	Per Cent. Nitrogen.	Per Cent.	Per Cent.
Nitrogen—				
In coke	0·89	0·680	..	43·31
In tar	1·17	0·047	..	2 98
Nitrogen as ammonia—				
(*a*) In liquor	1·52 NH_3.	0·237	15·100	15·16
(*b*) In end gas	..	0·001	0·060	
Nitrogen as cyanogen—				
Cyanides in liquor	0·036 HCN.	0·0035	0·226	1·43
Cyanides in end gas	55·54 grs. 100 cb. ft.	0·0183	1·170	
Sulphocyanides in liquor	0·013 sulphur as SCN.	0·0005	0·033	
Nitrogen in gas and loss (difference)	..	0·5827	..	37·12
	..	1·5700	..	100·00

That the length of time of distillation influences the percentage of nitrogen left in the coke has been shown by Anderson and Roberts, who find that if coal is quickly carbonized a much larger proportion of nitrogen is retained in the coke than is the case with slow carbonization. In a laboratory distillation with the coal used in the above investigations, I found that 64·91 per cent. of the nitrogen of the coal remained in the coke—a result considerably higher than that obtained on the working scale. The length of time of distillation was, in the laboratory experiment, about three hours, as against 28 to 29 hours on the large scale. The average percentage of nitrogen yielded as ammonia in the laboratory distillation was 16·05 per cent.

Distribution of Sulphur.—The figures for the distribution of sulphur were obtained in a manner similar to those for the nitrogen distribution. The average sulphur contents of coal, coke, and tar were determined; and the percentages of sulphur re-appearing in the coke and tar were obtained from these figures. The analysis of the ammoniacal liquor gives the ratio of ammonia to sulphur in it. The ammonia obtained from the liquor corresponds to a certain percentage on the coal. From the ratio of ammonia to sulphur we can calculate back the sulphur contained in the liquor to the percentage on the coal. Knowing the sulphur content of the coal, we can easily calculate the percentage of the sulphur which appears in the liquor. The distribution of the sulphur in the liquor is shown in Table IV.

The sulphur in the gas existing as sulphuretted hydrogen was determined, and also the sulphur compounds other than sulphuretted hydrogen which are contained in the gas. Assuming as before that a ton of coal yields 10,000 cubic feet of gas, the figures can be calculated back to percentage on the sulphur contained in the coal. The distribution of sulphur is shown in Table VI.

TABLE VI.—*Sulphur Distribution.*

[The dry coal contains 0·824 per cent. sulphur.]

—	—	Calc. on Dry Coal.	Total Sulphur.	Total Sulphur.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Sulphur—				
In coke	0·782	0·598	..	72·53
In tar	0·300	0·012	..	1·45
Sulphur as sulphuretted hydrogen—				
(*a*) In gas	240·600 Grs. per 100 Cub. Ft.	0·153	18·56	24·00
(*b*) In liquor	0·237	0·045	5·44	
Sulphur as compounds other than sulphuretted hydrogen—				
(*a*) In gas	14·920 Grs. per 100 Cub. Ft.	0·009	1·149	1·72
(*b*) In liquor	0·025	0·004	0·574	
Difference, loss, &c.	..	0·003	..	0·30
	..	0·824	100·00	100·00

It was necessary to make the tests on the gas when the sulphate plant was shut down, since the waste gases from the saturators are passed back into the gas-main and mix with the gas from the ovens—being ultimately burned in the flues. Since these gases consist mainly of sulphuretted hydrogen and carbon dioxide, together with a small quantity of hydrocyanic acid, these compounds would come out abnormally high under ordinary working conditions.

A MAXIMUM AND MINIMUM PRESSURE GAUGE.

A recent issue of the "Journal für Gasbeleuchtung" contains an illustrated article describing an automatic maximum and minimum gas-pressure gauge which was exhibited by its inventor, Herr F. Lux, of Ludwigshafen, a short time ago before two of the Provincial German Gas Associations.

As shown in fig. 1, the apparatus consists of the ordinary U tube used for pressure-gauges, one limb of which has a lateral opening joined to a depending member terminating in a cock at the base. If, now, the U tube is filled to such a level that the liquid is on the point of overflowing into C, and the limb A is connected to a pipe in which gas is present under a positive pressure, some of the liquid overflows from B into C, and the height of the column in C is a measure of the pressure prevailing. When the pressure

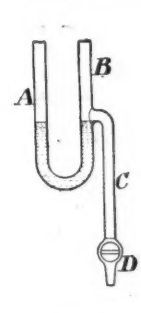


Fig. 1.

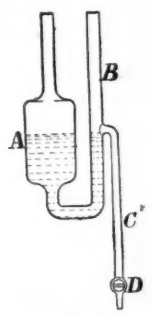


Fig. 2.

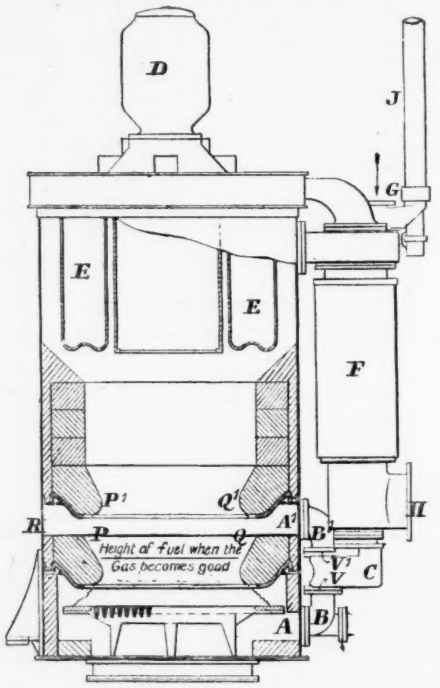
rises still further, more of the liquid runs over into C, and therefore the quantity of liquid in C at any moment is an indication of the maximum pressure of the gas since the instrument was last set by opening the cock D and adding fresh liquid. Conversely, if the limb B is connected to a pipe in which gas is present, under a negative pressure, and the apparatus is then filled with liquid until it is on the point of overflowing, any decrease of pressure in the pipe causes liquid to run over into C, and this height is again the measure of the change in pressure—in this case minimum pressure. By making the tube C much smaller than A and B, as represented in fig. 2, the instrument gives enlarged readings, and thereby becomes more delicate. For practical purposes the gauge may be used in duplicate; the limb B being fitted with a stop-cock pointing upwards, and then being turned down again

so as to become the limb A of a second gauge. So arranged the apparatus may be placed between the hydraulic main and the exhauster in order to show the lowest vacuum that has prevailed there during (say) the last 24 hours. By connecting both limbs of the double apparatus to a distributing system, the gauge will show the maximum and minimum pressure since the last time of reading; or it may be employed to indicate the maximum difference in pressure between the inlet and outlet of a purifier.

SUCTION PRODUCERS.

DIFFICULTIES AND DANGERS IN PURIFYING POOR GAS.

M. Camille Roche, in a paper read before the Société Technique du Gaz pointed out the uncertainty existing as to the purification required for poor gas. Various replies are given to the questions: Is it necessary to take out the sulphur? and, Can it be burned in the engine? On one point all are agreed—namely, that gas arriving at the engine should be freed from all dust and tar. As with illuminating gas, there is physical purification and chemical purification. The former is effected by condensers (Pelouze) and washers; the exhauster being interposed between the first two. Chemical purification is done in the purifiers. The same practice has been followed, for the most part, also for poor gas; but the author's conclusion from experience in working is that important modifications ought to be made; his object being to show the little use there is for a chemical purifier after a good washer.



A A'. Air Inlets. B B'. Air Inlet Pipes. C. Chamber at Bottom of Superheater. D. Hopper. E. Boiler. F. Superheater. G. Air Inlet to Superheater. H. Gas Outlet to Hydraulic Main. I. Air Inlet to Fan. J. Chimney. PP'QQ'. Fuel Levels. R. Sight-Holes. VV'. Valves.

Roche's Suction Producer.

He describes a producer (see illustration) for an engine of 200 to 250 H.P. Its circular grate is 900 mm. (35½ inches) diameter, and has a surface of 65 square decimetres (1007 square inches). The air for combustion enters at two cylindrical points, one above the other, A and A', through pipes B and B'. Regulation is effected by the valves V and V'. This air reaches the chamber C at the bottom of the superheater, after having been charged with steam in the boiler and in the superheater itself. Lighting up is done by blowing from the fan; the two valves V and V' being shut. The air enters at A. The gas becomes good when the bed of anthracite is about 250 mm. (10 inches) thick. The total surface of air on the fuel is 1·25 square metres (1937 square inches) for 200 to 250 horse power, or 60 square decimetres (930 square inches) per 100-horse power.

This producer was adopted after many tests, and has given the best results. It has been well thought out in its details—more especially from the point of view of cooling the gas produced. There is an outside regenerator where the air for combustion is heated by contact, and is moistened by a fine spray, which becomes vaporized. The gases produced at a temperature of about 1200° C. leave the producer at a temperature varying between 100° and 200° C. according to the make. The gas-pipes to the engine are 250 mm. (10 inches) in diameter. The washer is placed after the hydraulic main; and it performs the double function of cooling the gas and arresting the tar and dust. The amount of water used is about 15 litres (3·3 gallons) per horse-power-hour, and at the outlet has a temperature of about 40° C. (104° Fahr.). In the washer the sulphurous and hydro-sulphuric gases, in contact with the water and the dissolved oxygen of the air, become decomposed, with the formation of water and deposit of sulphur. The greater part of this sulphur is undoubtedly carried away by the water of the washer.

A ferro-concrete purifier (6 m. by 5 m. by 1·80 m.) was placed after the washer; and at the moment of starting it absorbed a pressure of 10 to 15 mm. After a month, the two tiers of oxide of iron, each 400 mm. (16 inches) thick, became moist, and took 200 mm. pressure. This material, saturated with water, no longer allowed gas to pass. When dry, it showed no change of colour, nor of texture, nor of weight, nor any chemical reaction. Perhaps, at the outlet of the washer, the gas did not contain any sulphur, or the sulphur was not in a state of being able to act on the hydrated oxide of iron; or, again, the sulphur may not have been in the presence of the necessary bodies to react on the oxide, such as ammonia, cyanides, &c. Which of these theories is the true one, has not been ascertained. But the oxide was done away with, and the purifier filled only with tan. It played the part of a governor for, or fly-wheel to, the gas.

Two explosions occurred during the working. The engine was started by shutting the valve of the fan, and by fully opening valve V, and half opening valve V'. This was the mistake; for air entering at A' formed an explosive mixture, and when the fire reached the level PQ, explosion followed. In normal working, the fire is observed from sight-holes, R. It never reaches higher than the level P'Q'. Air can be introduced without danger at A' when working; for this air increases the activity of the fire and gas production, cools the clinker, and makes clinkering easier. But, when lighting up, on the contrary, as the fire is below the level PQ, and is not seen at R, the introduction of air at A' produces an explosive mixture, and the valve V' ought never then to be opened.

The author's conclusions are: (1) In a suction apparatus, re-entries of air are always to be feared; safety demands doing away with any gas storage, which is at any moment very likely to contain an explosive mixture. (2) On the other hand, the installation of hydraulic mains, washers, and pipes need not give rise to fears of explosion, either because the water contained prevents the whole catching fire, or on account of the large cooling area of the sides, which has the same effect.

Death of Mr. Herbert F. Burrows.

We regret to record the sudden death on the 30th ult., at his residence, Sefton Park, Liverpool, of Mr. Herbert Firth Burrows, partner with his brother, Mr. Freeman Burrows, in the Torbay Paint Company (Messrs. Stevens and Co.). Deceased, who was in his 48th year, was apparently in his usual health the previous day, and was playing golf in the afternoon. In the evening he was taken suddenly ill, and succumbed next day to heart failure. Deceased was one of the most prominent Freemasons in West Lancashire. He was P.M. of the Croxteth United Service Lodge (No. 786), a Founder and First W.M. of the Imperial Lodge (No. 2711), and a Past Prov. Grand Deacon of the Province. He was the Hon. Treasurer of the West Lancashire Alpass Institution for Widows of Freemasons, and one of the Hon. Secretaries of the Masonic Committee formed for the building of a Lathom Memorial Chapter House in the Liverpool Cathedral. He was initiated in the Lorne Lodge (No. 1347), Sutton, in 1881; and eight years later he was elected a joining member of the Croxteth United Service Lodge, and in 1898 of the Lathom Lodge (No. 2229), Southport. He was a Royal Arch Mason, having been exalted in the Sefton Chapter (No. 680), Liverpool, in 1890, and installed in the chair of First Principal in 1896. In 1893 and 1894, he served as Prov. G.D.C., and in 1897 was appointed Prov. G. Scribe N. He served as Steward for, and was a Life Governor of, the three Central Masonic Institutions, and likewise of the four which have been established by the Brethren of West Lancashire. At the Grand Festival of the United Grand Lodge of England in the spring of 1904, he was invested by the M.W. Grand Master as one of the Grand Deacons for the year. The funeral took place last Wednesday afternoon in the presence of a large gathering of Masonic Brethren and private and other friends, which testified to the great esteem in which the deceased had been held.

The Workmen's Compensation Act, 1906.—Now that public companies and business firms are beginning to realize the full effect of the above-named Act, attention may be called to a small volume, just issued by Messrs. Eyre and Spottiswoode, containing the text of the Act and the County Court Rules relating thereto, with notes. It is by Mr. F. L. Firminger, of Gray's Inn and the South-Eastern Circuit, who has aimed at making the book serviceable to the legal profession, Insurance Companies, and all whose business will necessitate reference to the Acts relating to workmen's compensation. The one passed in 1897 has proved fertile in litigation; and Mr. Firminger is of opinion that the Act of the past session will give rise to numerous decisions. The text, which is very fully noted, occupies 160 pages, and the seven appendices 100 pages more. There is an index to cases cited, as well as a general index. The price of the book is 5s.

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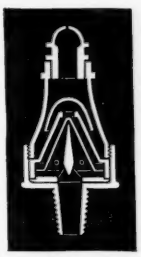

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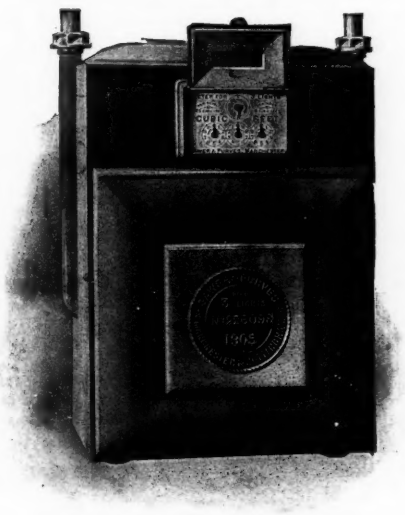

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For Latest Example, see "Gas Journal" of April 16, pages 150 to 153.

REGISTER OF PATENTS.

Distilling Coals and other Hydrocarbonaceous Substances.

ALLISON, C. A.; a communication from the American Chemical Eduction Company, of New York.

Nos. 11,925 and 11,926; May 22, 1906.

This invention relates to the distillation of solid hydrocarbonaceous materials—such as cannel and other coals, block and splint coals, shales, lignites, &c.—from which, by the application of heat, there are obtainable raw and crude oils and waxes, and that yield, when subjected to the proper processes, paraffins, hydrocarbon oils, phenols, creosols, naphthas, ammonia, and other products.

The distillation, if carried out at low temperatures for the purpose of producing lubricating oils, oil vapours, and waxes directly, and free from tar, benzol, naphthalene, sulphur, &c., has heretofore presented a difficult problem for solution, the inventors remark. Many processes have been suggested and attempted; but "none has proved of practical value when tested commercially, owing to the various defects which have interfered with their successful operation and prevented the obtaining of products capable of standing the commercial tests."

Where it has been proposed to destructively distil carbonaceous materials in a retort at a temperature of 750° Fahr. by means of a current of neutral gases (with or without external heating of the retort), by one method the substance has been deposited in a mass in the distilling chamber and air has been drawn into and through a fire from the top to support combustion—being thus, theoretically, deprived of its oxygen—and the gaseous products of combustion are drawn or forced through the body of material below the fire, and the vapours thrown off by the action of the heat on the material have been carried by the currents to the condenser. In another method the substance has been deposited in the chamber some distance from the fire, and the products of combustion drawn into the chamber over a bridge wall and caused to strike down on the material. By the former method, the substance melts under the heat and forms a more or less dense mass, which the gaseous products of combustion are unable to pass through; and when the operation has proceeded for a short time it must necessarily cease, because it is impossible to draw the air into the fire or the products of combustion through the material. Furthermore, it is evident that the draught will cause the fire to work down into and through the coal, which will be entirely consumed with the vapours distilled from it. In the second method, as only the surface of the material is acted upon directly by the heat currents, the great mass will not be distilled.

The present invention has for its object, first, to promote the rapid, continuous, and practically simultaneous distillation of an entire charge of coal without destruction of the solid carbonaceous residuum, depositing the charge divided into relatively small isolated bodies in a distilling chamber, and passing currents of gaseous products of combustion derived from a non-contiguous fire, heated to a temperature below red

Fig. 1.

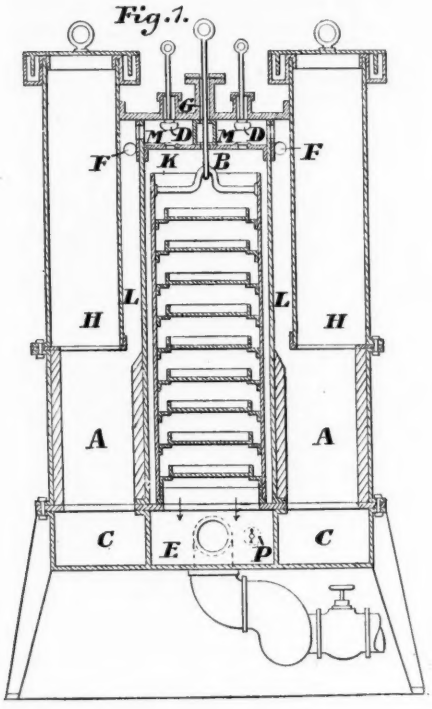


Fig. 2.

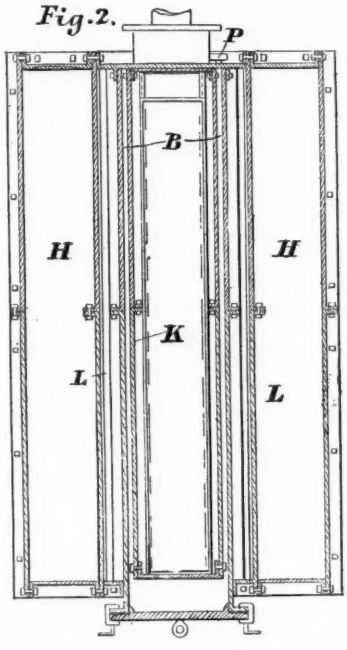
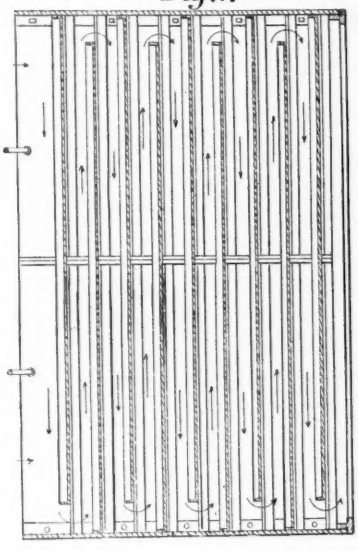
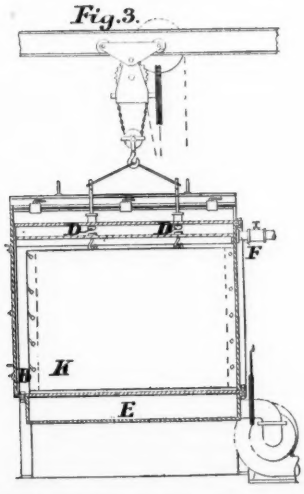


Fig. 4.



American Chemical Eduction Company's Plant.

Fig. 3.



heat or incandescence—say, from about 700° to 800° Fahr.—into the chamber and over and under the several bodies successively, so that the distillation proceeds rapidly and practically at the same time in all the bodies. In this way the time required for distilling the charge is said to be greatly reduced; the distillation is complete; and the liability of dissociation of the initial products is avoided.

A second object is to ensure an uninterrupted movement of the distilling agent through the distilling chamber, and the contact thereof with the material. This part of the invention consists in dividing the charge into relatively small bodies, depositing these bodies on trays or shelves in the distilling chamber, adjusted to form a zig-zag passage through the chamber, and causing currents of gaseous products of combustion to pass through the passage and sweep over the tops of several bodies and under the shelves or trays, whereby the distillation is caused to proceed rapidly, continuously, and uniformly through the several bodies.

A third object is to prevent dissociation of the initial products of the distillation of hydrocarbonaceous substance—oils, oleaginous vapours, vapours of paraffin, phenols, &c.—by the heat of the distilling agent and that engendered in their production, by producing a current of the hot gaseous products of combustion through the distilling chamber and over and under the bodies of the substance undergoing distillation, and sweeping away the hot products of combustion and the oils and vapours from the inflowing heat by means of the current as rapidly as they develop, and carrying them out of the distilling chamber to the condenser.

A fourth object is to produce a uniform distillation of the charge, and thus reduce the time required for the distillation, prevent destruction of the residuum, and the dissociation of the initial products by exposing one or more parts of the charge to the heat for a longer period than other parts. This part of the invention consists in dividing the charge into relatively small isolated bodies, subjecting them separately and contemporaneously to the action of the gaseous products of combustion, separating the vapours as fast as they are developed from their source, and removing them from the distilling chamber as rapidly as they are thrown off.

The nature of the process is "wholly dissimilar from the destructive distillations earlier mentioned, and, inasmuch as the initial products are obtained from such substances without dissociation, the initial products are free from tar, naphthalene, benzol, &c., and an abundance of dense lubricant oils and of solid paraffin wax are produced."

The invention further comprises distilling coals (particularly cannel coals) by means of the deoxidized products of combustion derived from a fire separated from the coal undergoing distillation, or by means of neutral gases, at a temperature below that which produces red heat or

incandescence, and reducing the pressure of the distilling medium by exhausting it from the chamber in which the distillation takes place, thereby creating currents of the heated products of combustion or the neutral gases through the chamber, and drawing them, together with the vapours distilled from the coal, out of the chambers as they are formed, to prevent increase of temperature by the compression of the gases and vapours, and to prevent secondary action or dissociation from taking place with the waste of energy involved—thereby "economizing and hastening the process of distilling and the production of the vapours."

This method of distilling is said to produce a superior variety of coke. As a result of the comparatively low temperatures at which the distillation is carried on (no combustion being permitted to take place) no "coking" of the coal in the ordinary technical sense of the term ensues; and the residual coking having been effected below incandescence, "the product differs from all cokes heretofore produced in its properties." It "approximates closely to charcoal in its softness, porosity, ease of ignition, and free-burning qualities." By virtue of these peculiarities, it is, moreover, much more readily and rapidly acted on and dissolved by highly-heated steam, in the manufacture from it of water gas for direct fuel uses, or for a medium to take up the vapours of hydrocarbons in making water gas for heating and illuminating ses.

Apparatus constructed according to this invention consists of an exterior structure in which are embraced the fire-chambers and heat-flues, fuel-magazines, a compartment between the fire-chambers and the heat-flues, and a trough below the compartment into which the vapours descend on their way to a pipe leading to an exhauster, by which they are drawn out and driven to the condenser. The apparatus also comprises a casing that fits snugly into the compartment, and in which the material to be distilled is placed, and which is adapted to be readily placed in, or withdrawn from, the compartment.

Fig. 1 is a vertical cross section of the apparatus taken through the centre. Fig. 2 is a horizontal section. Fig. 3 is a sectional side elevation (on a reduced scale). Fig. 4 is a longitudinal vertical section of the casing which forms the receptacle for the material,

The exterior structure is preferably built of plate steel or iron, and at the sides, near the bottom, there are fire-chambers A between the exterior walls and the walls of the compartment B. The fire-chambers are lined with fire-brick and provided with grate-bars. The rear wall-plates are joined to the side walls so as to close completely the chambers at the rear; and at the front they are closed air-tight by flanged plates let into the front of the chambers and secured by bolts. Below the fire-chamber are ash-pits C, and between them, and directly under the compartment B, there is a trough E (having a vapour exit at the rear) to which is fastened an exhaust-pipe that leads into the casing of a rotary exhaust-fan shown in fig. 3.

Above the fire-chambers are fuel-magazines H, having at the top exterior water-troughs to receive the rims of covers forming water seals. Between the walls of the compartment B and the walls of the fuel-magazines, there are vertical heat-flues L leading from the fire-chambers.

The compartment B is closed at the top by a cover riveted to the walls of the magazines, and a short distance from the cover the walls are provided with perforations. The bottom plates are furnished with valve-seats in the valve-chambers M. Valves D in the chambers have their rods passed through the tops, so that they can be opened and closed either by hand or by mechanical means. Just under the cover in the back walls of the heat-flues there are draught openings F, from each of which pipes lead to the stack (not shown).

Longitudinally of the cover of the casing there is a vertical slot G between upward extensions of the cover, which is open at the front. The tops of the extensions are turned over at right angles so as to form flanges on which a plate is luted with clay, and fastened to form an air-tight cover for the groove when distilling is going on. Hooks are passed down through the slot G into the compartment B, so as to lift and carry the casing K when it is moved in and out of the compartment. The casing fits into the compartment easily—only space enough being left between to allow for expansion, so that as much as possible of the heat from the flues will radiate through the walls and reach the contents. The casing is provided with longitudinal brackets on which brackets trays are placed (but not fastened, so that they can be slid in and out of the casing at the front or open end). The trays are not so long as the casing, and, when filled with the material to be distilled, they are staggered, so that spaces are left between their alternate ends and the end walls of the casing—a zig-zag passage being thus formed. The heated products of combustion drawn through the casing are thus compelled to traverse the entire length of the trays and their contents twice—first over the top, and then under the bottom.

The operation of the apparatus in the distillation of the coals is as follows: The casing rests when in the compartment on the base-frame shown in figs. 1 and 3. To move it out of the compartment for the purpose of putting the material on the trays, it is lifted by means of the pulley until it is suspended just above the base-frame, and (the door of the compartment having been previously removed) the casing is run out of the compartment by means of the trolley. The trays are then filled with coal; and the trays are carefully adjusted so that a zig-zag passage is formed through the casing. The door of the casing is then put in place to close the front, and the casing then run back into the compartment and lowered until it rests on the base-frame. The fires are then started up and the dampers in the pipes (only one of these pipes and dampers being shown) leading to the stack opened for a short time to quicken the fire. When the temperature in the apparatus reaches (say) 750° Fahr.—or below red heat or incandescence, as indicated by the pyrometer P—the dampers are closed, and the exhauster is driven at high speed. The effect of this is to draw the hot, gaseous, neutral (or deoxidized) products of combustion up through the heat flues; then through the perforations into the valve-chambers; and then downward into the casing past the valves D through the zig-zag passage, through the casing K, as indicated by the arrows. In passing downward, following the passage, it necessarily passes over the top of the coal on the trays to the spaces between them and the end walls of the casing; and, descending through these spaces, it passes in the opposite direction under the bottoms of the trays. Thus the coal in each tray is exposed to the rapidly moving currents of the hot products of combustion; and "the action of the heat in drawing out the oils is continuous and rapid. The temperature not being sufficiently high to dissociate the initial products, tar, naphthalene, benzols, &c., are not developed, large quantities of paraffins are produced, and the residual coke is hard, porous, free burning, and practically quite devoid of volatile matter—these qualities assimilating it more nearly to charcoal than to the coke produced by high temperatures in coke-ovens."

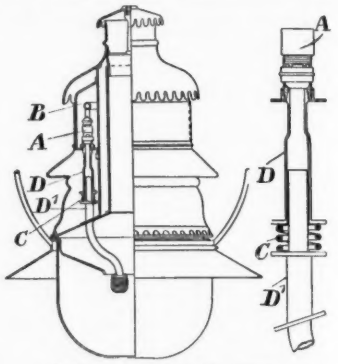
The temperature of the products of combustion is regulated by the valves D, by means of which it can be maintained between 700° and 800° Fahr., or below red heat or incandescence, at which point the desired results are obtained. By means of these valves, "the currents of heated gases or vapours are managed in such ways as to accomplish all the chemical objects aimed at. The currents of the products of combustion containing carbonic oxide are made to pass through the decomposing coal from above downward; thus sweeping the heavy vapours away from the heat as rapidly as possible, and preventing secondary action and dissociation. Hence, the total absence of tar, naphthalene, and benzol, and the unprecedented amount of phenols that are formed. Hence, also, the short duration of the operation, compared to that of the white-hot gas-retort, in which the heat is largely expended in the work of dissociation of the first products."

Gas Lamps and Burners.

HELPS, GEORGE, of Nuneaton.

No. 13,813; June 16, 1906.

In one method of construction of this lamp, the air-cones A and nipples of the inverted burners are contained in an annular-shaped box B secured to the chimney or body of the lamp in such a manner that it, together with the air cone and nipples, can be readily removed from the lamp without the tubes of burners. The box is provided with air inlets and means of access for adjusting the air to each burner, and rests on a supporting ring secured to the chimney.



Helps's Inverted Gas-Lamp.

The casing of the lamp below the chimney projects in such a form that it acts as a reflector and so that the burner-tubes D D¹, consisting of two tubes, one sliding or screwing over the other and held in position by springs C or nuts, may be fixed in between the annular box and the casing. Shoulders, flanges, or projections are made on the burner-tube to regulate the distance that the nozzle end of burner-tubes project through holes in the casing. They also form a close joint between any air on the outside of the lamp casing and the products of combustion inside.

Water-Gas Producers.

CLARK, W.; a communication from the Dellwik-Fleischer Wassergas Gesellschaft, of Frankfort-on-the-Main.

No. 18,256; Aug. 14, 1906.

This invention more especially relates to producers working on the Dellwik system, and which have hitherto been worked solely with compressed air. The proposal is, however, to work them with "suction air;" plant being provided with a charging device in the form of a coal-feed hopper erected directly upon the producer, and the gas-main leading from the charging device to a fan. A bye-pass pipe for the fan is provided, for the purpose of heating-up and keeping the producer hot while at rest.

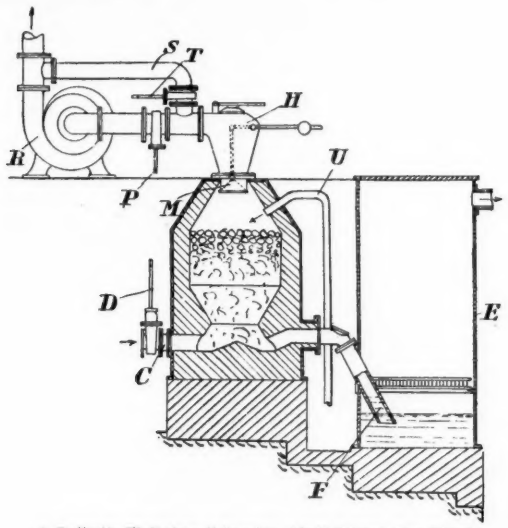
The grate hitherto usually employed for such producers is dispensed with, so that the producer charge rests immediately on the producer bottom, or rather the resulting layer of ashes and slag.

The steam-pipe opens into the producer at the top; while the gas-pipe is led off from the bottom of the producer (and not from below the fire-bars as heretofore), and discharges into a scrubber arranged at a lower level. Here a water seal is provided, so that the issuing gas is able to pass into the scrubber; while the indrawing of the air when the producer is being blown-up for heating only results in a rise of the scrubber water into the gas-pipe.

As shown next page, the blast enters through the pipe C fitted with a slide valve D, while communication with the scrubber E (at a lower level) is established by the pipe F, which extends below the level of the water into the scrubber. H is the coal-feed hopper, which is emptied by depressing the cone M by the lever shown. The hopper has connected to it the pipe provided with a sheet-metal slide-valve P and connected to the fan R. S is a bye-pass pipe fitted with a sheet-metal slide-valve T, which has a large opening corresponding to the cross-sectional area of the pipe, and also a very small opening. U is the steam-pipe.

On starting, the slide P is closed and the slide T is opened wide, in order that the resulting gases may be able to escape without hindrance through the bye-pass pipe S into the chimney. The cone M is lowered,

and the blast slide D is opened according to requirements. Later on, in heating up (suction), the blast slide D is opened completely, and, of course, the slide P also; and the slide T having been closed, the fan R is started. During working, the slide P is permanently open and the slide T is always closed. After sufficient heating up, the fan is stopped, and the generation of gas commences. The slide D and the cone M are closed, and steam is admitted through the pipe U. The gas escapes at the bottom, through the pipe F, into the scrubber. During the "slagging" operation, the slide valve P is entirely closed, and the slide valve T is moved into a position in which the resulting waste gases can escape only through its very small opening. The same position is chosen when the producer is stopped over night, but when it is desired to maintain the heat.



A Dellwik-Fleischer "Suction-Air" Water-Gas Plant.

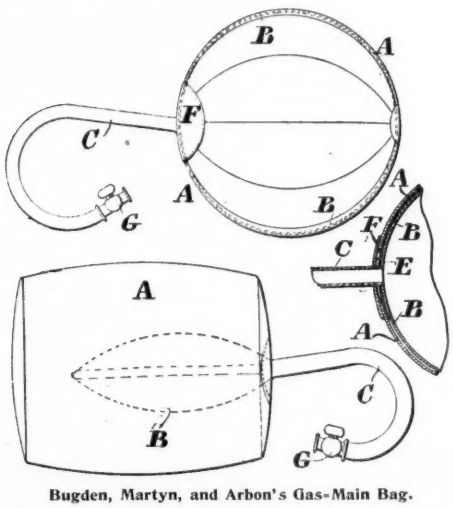
The patentees remark: In addition to the well-known advantages of the absence of a grate, the light work of slagging, the generation of good water gas containing little carbonic acid, which always issues at the hottest point, there may be further mentioned that no loss of steam through badly-shutting gas-valves can occur, because there are none, and that the danger of poisoning from water gas passing out at the uptake is obviated, as, even if the feed hopper should be closed imperfectly, only steam (and never water gas) can escape outwards, because the gas is led away at the bottom at F, and the upper space of the producer is filled only with steam during gasification. Similarly, during the heating blow, blow-gases cannot escape at the top into the space, as has been the case hitherto, because, by reason of the suction-working, if there are any leaky joints and covers, although air may be sucked in, gas can never pass out.

Gas-Main Bags.

BUGDEN, T., MARTYN, H. C., and ARBON, A., of Goswell Road, E.C.

No. 20,301; Sept. 12, 1906.

This gas-main bag is composed of two bags—one an elastic bag in flexible connection with a tube for inflation, and the other an outer flexible bag loosely surrounding the elastic bag and connected to it by a flexible connection.



Bugden, Martyn, and Arbon's Gas-Main Bag.

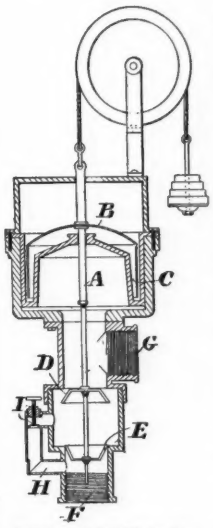
Two forms of the bag are shown. A is the outer bag—of spherical, cylindrical, or other suitable form—made of non-elastic flexible material. When made of rubber cloth, it is preferred to have this vulcanized, in order that it may better resist the "main liquor" or other injurious deposits. B shows the inner bag—of rubber, skin, or other flexible elastic material—in flexible connection with a tube C. Over the end of the tube which passes through the bag is secured, by adhesive material, a disc E, of rubber, so as to come inside the bag A. This disc E may be cemented directly on to the inner bag—the outer surface of the disc being adhesive. The bag A extends a short distance over the disc. Another disc F, of rubber cloth coated on its inner surface with adhesive material, is then passed over the tube C. When the two discs are pressed together, they become cemented to one another except at their outer edges, where the bag A comes in between, as shown in the section. The outer edge of the disc F is then sewn to the bag A, thus making a complete joint.

Controlling the Supply of Atmospheric Air to Purifiers.

STOTT, J., of Oldham, and SAVILLE, G. E., of Penmaenmawr.

No. 21,581; Sept. 29, 1906.

This apparatus for controlling the supply of air to purifiers for the purpose of revivifying the oxide of iron *in situ*, while at the same time acting as a back-pressure or safety valve, and preventing any back flow of gas, is shown as consisting of a governor, either mercurial or water sealed, or actuated by a flexible diaphragm; the rod A of the governor carrying the bell float B, which dips in the mercury trough C, and also two valves D E, arranged in opposite directions. The inlet F is to the outlet of a meter, the inlet of which is open to the atmosphere. The outlet G is connected to the main leading from the condensers to the exhauster.



Stott and Saville's Air-Regulator for Purifiers.

The effect of oscillation of pressure in the gas-main caused by the motion of the exhauster is that at the moment the draught or suction caused by the exhauster is the most, it pumps in atmospheric air through the apparatus. The valve E, actuated by the mercurially sealed float B or gasholder, almost, or entirely, closes the inlet F in proportion to the pull of the exhauster. At that time the air is either partially or wholly passing through an orifice or bye-pass H, the outlet of which is controlled by a regulating screw-valve I. If at any time the speed of the exhauster should be too slow, or the exhauster accidentally stop (either of which would cause a pressure of gas within the mains), the safety valve D closes the outlet and prevents any back flow of gas.

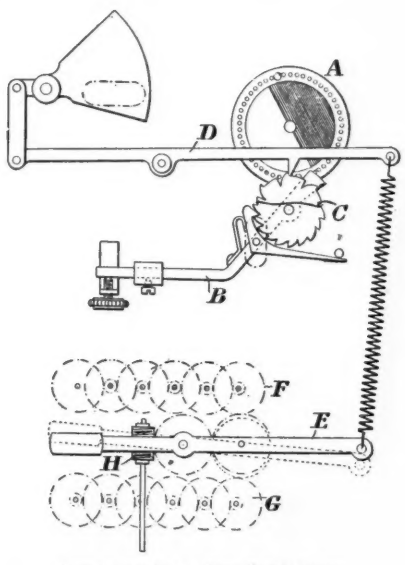
The gasholder or float B, together with the valves, are counterbalanced by weights suspended on a chain working over a pulley connected to the rod A; and the weights are so adjusted that the holder or float, with the rod and valve, are slightly the lightest weight. The effect is that the valve D closes a little in advance of any pressure within the holder or float.

Meters for the Supply of Gas at Two Different Tariffs.

HARDINGHAM, G. G. M.; a communication from Landis and Gyr, (formerly Theiler and Co.), of Zug, Switzerland.

No. 24,197; Oct. 30, 1906.

This invention relates to meters applicable for the supply of gas or electricity where the supply is effected at two different rates at different periods of the twenty-four hours.



Landis and Gyr's Two-Tariff Meter.

As shown, the clockwork is employed to rotate (once in twenty-four hours) a disc A furnished with holes about its periphery. The disc is marked to indicate the hours between midnight and noon, and between noon and midnight; and pins are inserted in the holes in the disc in the positions corresponding with the hours at which it is desired to change the charge for the supply from the one tariff to the other. For

this purpose, the pins upon the disc engage one arm of a pivotally-mounted inclined and counter-weighted lever B, furnished with a spring-pawl which engages a ratchet attached to the spindle of a wheel C, the periphery of which is formed with indentations alternating with projections. This wheel serves to impart a to-and-fro movement to a pivotally-mounted arm D formed with a lateral projection, which engages and disengages the indentations on the wheel C when the latter is rotated. An adjustable stop is provided to regulate the movement of the lever B and the rotation of the wheel C; while rotation of the wheel in the opposite direction is prevented by the indentations when the arm is in engagement with it. When the arm D, however, is supported upon the periphery of the wheel C, it engages the projections upon the latter and prevents the wheel rotating. One extremity of the arm is connected (preferably by a spring) to a lever E pivotally-mounted between two counting mechanisms F and G. With the latter a pinion mounted on the lever E is adapted to engage; the pinion being rotated by worm gearing H mounted upon a shaft driven by the motor of the meter. When the lateral projection upon the arm D enters an indentation in the wheel C, the pinion is brought into engagement with the counting mechanism G corresponding to the one tariff; while, when the lateral projection is not so engaged, the pinion is in gear with the mechanism F corresponding with the other tariff.

For indicating which particular tariff is for the time being in operation, the arm D may be connected to a quadrant arranged opposite an opening in the clock dial and marked to correspond with the respective tariffs.

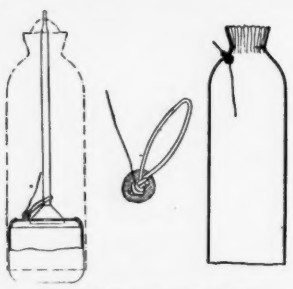
Igniters for Incandescent Gas-Mantles.

HOFMANN, R., of Frankenberg, Saxony.

No. 27,079; Nov. 28, 1906.

Gas-igniters of the kind here referred to have been made by soaking meerschaum with a concentrated solution of platinum, or by pressing platinum in the form of platinum black. The first kind require a considerable, and therefore expensive, mechanical working; while igniters of platinum black contain much platinum when compared with their acting surface, and are liable to mechanical injury.

The igniter of "catalytically acting material"—such as platinum in the form of platinum black—is arranged round a knot of refractory non-catalytic material such as asbestos, which latter thus constitutes the core of the igniter proper, and has no influence upon the catalytic action of the latter. The knot is dipped into (say) a mixture of platinum black, or the latter is applied by a brush to the knot.



Hofmann's Gas-Mantle Igniter.

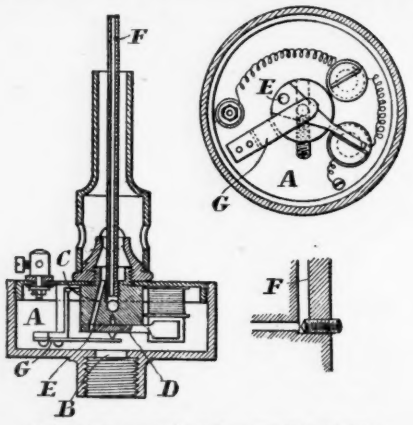
As shown, a thin thread of asbestos is knotted into a tangle at its ends and a wire of platinum simultaneously attached to the knot. The knot, after the free ends of the asbestos thread are cut off, is dipped into a mixture of platinum black and nitrate of aluminium; and then the igniter is dried and burnt off. Two different ways of attaching the igniter to the burner and the incandescent mantle respectively are shown.

Lighting Gas from a Distance.

ABEL, K., and PERVESLOR, F., of Vienna.

No. 28,796; Dec. 17, 1906.

This invention relates to an electro-magnetically operated device for lighting gas from a distance—being an armature mounted by means of a spring so as to move over the lower surface of an insertion piece, which



Abel and Perveslor's Automatic Gas-Lighter.

forms the termination of the burner-tube. This member has a passage for the gas; and the armature is provided with a perforation which in one of its end positions registers with the perforation in the insertion piece. The position of the armature is controlled by an electro-magnet, between the two poles of which the armature is adapted to swing. The insertion piece is arranged to project downwards below the end of the burner-tube, and a passage is formed for the supply of gas to the pilot-flame tube through the insertion piece, so that the tube may project straight up through the centre of the burner-tube.

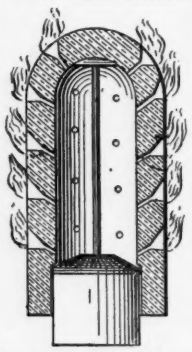
The chamber A communicates with the gas-supply pipe through an aperature B and with the burner-tube through a passage C, governed by an armature D adapted to swing between the poles of an electro-magnet. The armature has an aperture E, which communicates with the passage C. There is a plug attached to the cover of the chamber A and projecting downwards into the chamber. The pilot-flame tube F screwed into this insertion is constantly in communication with the chamber A by means of a cross passage. The regulation of the quantity of gas reaching the tube F is effected by a screw G. The spring presses the armature against its seating and secures its resting gas-tightly thereon, as soon as, by stopping the admission of gas, the pressure on the armature ceases.

Incandescent Mantle for Heating Purposes.

PENDREY, J. E., of Southall.

No. 2737; Feb. 4, 1907.

This "incandescent mantle for heating purposes" is composed of asbestos and fire-clay, or other refractory heat-radiating material, supported on an ordinary atmospheric burner in the same manner as an incandescent mantle for lighting purposes. The hollow mass of refractory material is closed at the top, where it rests on the head of the prop, and is laterally perforated for the escape of gas that, when lighted, raises the mantle to a high temperature.



Pendrey's Incandescent Heating Mantle.

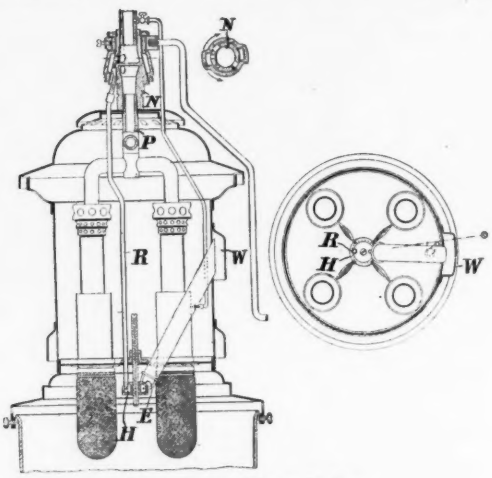
The mantle is provided with lateral perforations, preferably inclined upwards, the inner ends of which are of comparatively small diameter, while their outer ends are flared as shown. These outlets for the gaseous mixture are distributed over the lateral surface of the mantle, preferably at intervals of about $\frac{1}{8}$ inch; but no perforations are formed in the top of the mantle where it rests on the prop. The gaseous mixture is said to burn with "a blue heating flame and intensely heats the outer surface of the mantle, from which heat is radiated to the apartment."

Inverted Incandescent Gas-Lamps.

GRAETZ, A. & M., of Berlin.

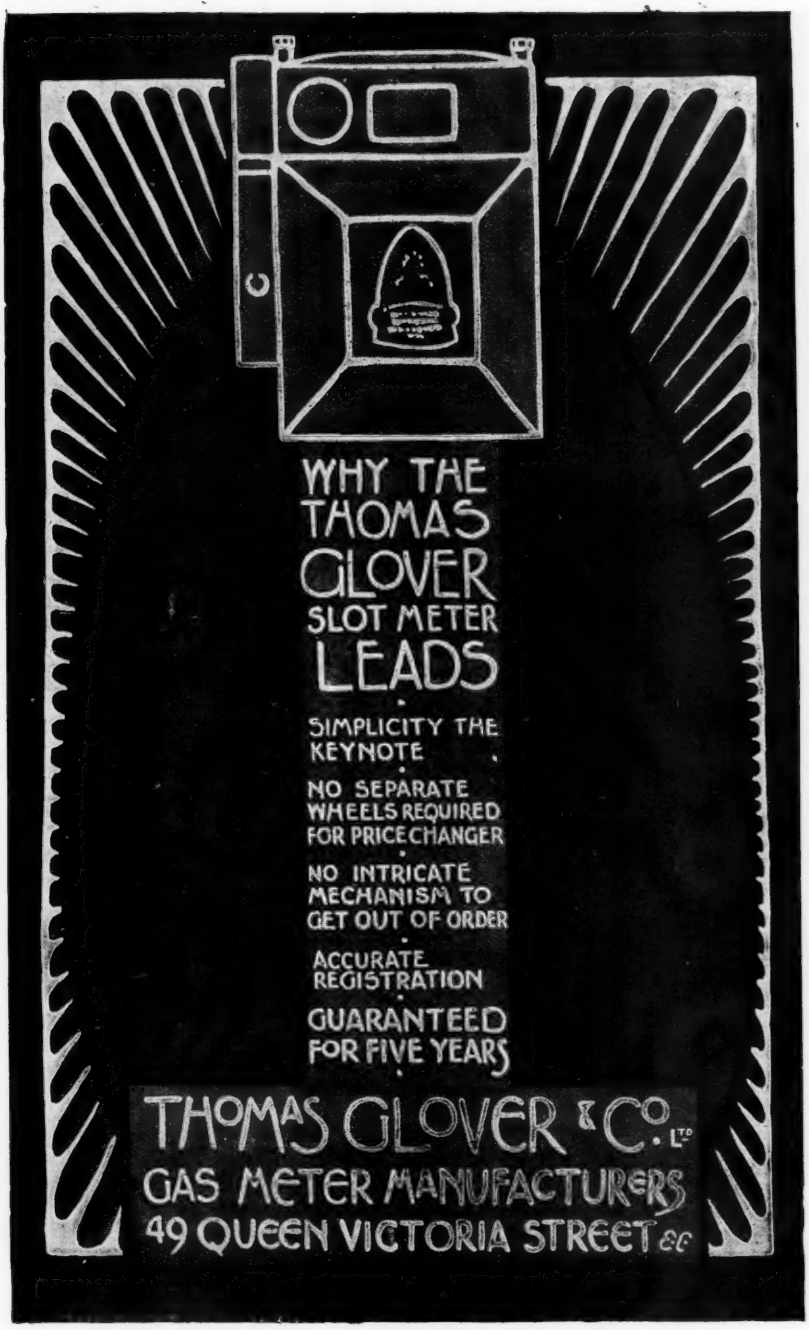
No. 3403; Feb. 11, 1907. Date claimed under International Convention, Nov. 3, 1906.

The patentees describe a method of lighting inverted lamps characterized by a device being used in which, owing to the striking-back of a flame, the ignition or lighting flames, and through these, the proper burner flames, are lighted. The striking-back of the flame in the ignition burner pipe is utilized for transporting the flame of the lamp lighter from a point arranged on the outer casing of the lamp (and visible from below) inwards to the proper burner openings, and thus for producing an ignition flame at a point inaccessible from the outside.



Graetz Inverted Lamp Igniter.

The casing of the lamp is closed against the atmosphere; and the mantles are (directed downwards) connected in the usual way to the burner pipes. In the centre of the lamp is a small gas-collecting casing H, provided with four burner openings and supplied with gas through the pipe R when the rotatable casing of the cock N is in the correct position to supply gas to the ignition flame pipe; the gas escaping from the casing H, through the opening E, into an ignition burner pipe, which opens into the hood W outside the casing of the lamp. If an ignition device be now applied to the upper opening of the ignition pipe, a flame is produced, which at once strikes back and produces a flame at the opening E—the flame lighting the ignition flames for the mantles, which are arranged close by and which escape from the openings. These small gas-flames are directed against the mantles, and when the casing of the gas-cock is rotated further relatively to the



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Extract from the "Harrow Gazette," April 19, 1907.

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walk from Harrow Metropolitan Station.

THE GAS COMPANY.—We have received the following communication from the Harrow and Stanmore Gas Company, and readily give it publicity. Mr. Chas. Chambers, Assistant Manager, writes :—"In your report last week of the Easter Vestries you state that electric light has been installed in Roxeth Church. This is quite wrong. The church is lighted with the 'Bland' system of incandescent inverted gas burners, which were fitted by the Gas Company last summer, to which the improved lighting is due ; and in addition there is a saving of over 50 per cent. in the gas consumed."

DURABILITY AND TONE.—There are two important qu d when

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Agents for Scotland: D. M. NELSON & CO., 53, Waterloo Street, Glasgow.

plug, gas passes into the supply pipe P for the incandescent burners of the lamp, and the small auxiliary flames at H ignite the gas jets escaping from the burners. After this ignition has been effected, the rotatable gas-cock is brought into the position in which the gas supply to the incandescent burners is maintained; but the supply to the ignition flame pipe R is cut off.

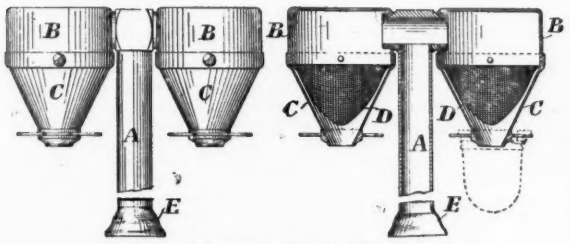
While in the arrangement described the ignition of the lamp from the outside is effected by means of a flame brought against the lamp casing, the essential point of the invention is that the ignition of the main flame should be preceded by an ignition of an ignition burner or similar device, which at once strikes back, and then, in its turn, ignites the real igniting flames.

Incandescent Burners.

SCHOMANN, B., of Great James Street, W.C.

No. 8397; April 17, 1907.

These incandescent burners (especially when used for outdoor lighting) can be arranged in much closer proximity to the burner-tube than heretofore without incurring the risk of overheating of the tube and consequent back-lighting of the gas. This is effected by arranging, close beside the upper end of the burner-tube, and in communication with it, mixing-chambers each of cylindrical form above, with a downward extension in the form of a conical frustum within which is a wire gauze screen of conoidal form, and at the lower end of which is the gas outlet, with an annular mantle support of the usual type for inverted mantles.



Bruno Schomann's Inverted Mantles.

In the engraving, the vertical tube burner A is in communication at its upper end, through a union, with a pair of mixing-chambers, each composed of a cylindical portion B and a conical portion C, within which is the wire gauze screen D (of conoidal form) to prevent flashing-back of the flame. Around the outlet orifice is secured the usual annular support for the mantle. In the lower end of the tube A air inlets may be formed provided with means for regulating the air supply. Preferably, however, the tube is supported by means of a flange E on the usual bunsen burner; the flange being interchangeable to adapt the tube to burners of various sizes.

APPLICATIONS FOR LETTERS PATENT.

14,522.—DOLAN, E. J., and TRACY, M. J., "Acetylene-burners." June 24.

14,523.—STEWARD, C. S., and LOWRY, W. T., "Acetylene-burners." June 24.

14,539.—BROMHAM, F. J. H., "Gas-producing apparatus." June 24.

14,551.—COWPER-SMITH, A. T., "Lighting and extinguishing lamps." June 24.

14,552.—COWPER-COLES, S. O., "Generation of power." June 24.

14,553.—COWPER-COLES, S. O., "Smokeless fuel." June 24.

14,571.—VAN PRAAG, D. J., "Acetylene-burner." June 25.

14,650.—LOMAS, T. P., "Gas cooking-stoves." June 25.

14,678.—COWPER-COLES, S. O., "Smokeless fuel." June 25.

14,683.—THORN, A. W., "Acetylene apparatus." June 25.

14,714.—WHITE, W. C., "Treatment and distillation of coal for the prevention of smoke and too rapid combustion." June 26.

14,774.—CROWTHER, A., "Flexible gas and water piping." June 27.

14,815.—BOSTOCK, F. H., "Prepaid meters." June 27.

14,879.—WOODROFFE, J. H., "Inverted lighting." June 29.

14,884.—BEAL, W., "Gas-pendants." June 29.

14,928.—ROESSLER, A. C., "Incandescent lighting." June 29.

14,956.—JENKINS, D. R., "Gas-furnaces." June 29.

15,035.—BIENECK, A., "Supporting chimneys of inverted incandescent gas-lamps." June 29.

15,047.—AKTIEBOLAGET GASACCUMULATOR, "Lighting and extinguishing gas-flames from a distant point." June 29.

15,049.—COWPER-COLES, S. O., "Smokeless fuel." June 29.

15,053.—WOODALL, H. W., and DUCKHAM, A. M'D., "Discharging vertical or substantially vertical retorts." June 29.

Pontefract Corporation Gas-Works Purchase.—The purchase of the Pontefract Gas-Works by the Corporation, in accordance with the terms of the Act of Parliament passed last year, was completed on Monday last week, when the purchase-money and other expenses were handed over. The price fixed by the Umpire (Sir Hugh Owen) was £69,600. At the meeting of the Town Council on Wednesday, authority was given to the Gas Committee to raise the price of gas if found necessary.

Accident at the Newark Gas-Works.—Last Sunday week, six men were overcome by gas at the Newark Gas-Works, but fortunately all recovered under medical attention. It seems that a valve connected with one of the holders had become stuck; and it was resolved to remove it on the Sunday morning for repair. The six men were told off for this purpose; but for some reason or another the bladders used to stop the pipes while the work was in progress burst, and all the men were more or less affected by the rapid escape of gas before they could get out of the inspection pit.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Distribution of Gas at Increased Pressure.

SIR,—I have been away for a week; and on my return I notice by the report in the "JOURNAL" for the 25th ult., that Mr. Charles Carpenter, in winding up the discussion on his paper on the above subject, read at the Engineering Conference in London, made an allusion, somewhat short-sightedly and what was also evidently intended to be slightingly, to the "Golden Rule" given in the "Handbook for Gas Engineers and Managers," relating to pressure in the mains.

Now, I have never been opposed to maintaining as high a gas pressure as may be necessary in any given case. I should be wanting in common sense otherwise. Nay, I am in favour of high pressure—amounting to pounds on the square inch—on trunk mains, wherever it can be applied with advantage and under proper conditions. In some of our largest gas undertakings, this has been done for years past, and to-day is a growing necessity—not, however, during the whole of the 24 hours, as advocated by Mr. Carpenter.

The vision of some critics is so restricted that they have difficulty in seeing beyond their own noses. What may be right for some—and especially for the few large concerns—is not applicable to the vast number, amounting to hundreds, of smaller works. A text-book, to be of use to those who need its assistance, must take account of the conditions generally prevailing. To most of these hundreds of gas-works throughout the country, the maintaining of high pressures during the 24 hours would simply mean disaster. And where is the need of it during all hours of the day and night?

Mr. Carpenter says that he used to read the "Golden Rules" in the text-book "when he was a boy." I am very pleased to hear this personal testimony (it is not every day that what one has written is recognized); and I believe that if he duly attended to the advice they give, and acted accordingly, he was a very intelligent and good boy, and later on grew to be a successful manager. Perhaps I am not claiming too much for the "Rules" in expressing the hope that, owing to their being impressed on his mind from boyhood, and by giving attention to what they inculcate, they may have contributed (in some slight degree, of course) to his attaining his present high position in the gas industry.

Manchester, July 5, 1907. THOMAS NEWBIGGING.

Mr. Tooms's Gas Institution Paper.

SIR,—With reference to Mr. Lyne's communication in your last issue, it is quite evident that he has no recollection of what he did say, or of what actually took place during the discussion on my paper at the Institution meeting. I am sure it is within the recollection of all present, with one exception, that I interposed no single remark during the discussion, and made no attempt to reply until called upon by the President. If Mr. Lyne had advanced any criticism at the meeting in the intelligible manner he has now amended it through your columns, it would have been possible, and I would have tried, to answer it. Rightly or wrongly, I considered I was doing Mr. Lyne a kindness by ignoring altogether the few wild remarks I was able to catch.

That the price of gas has a strong influence in increasing consumption cannot be disputed; and in my paper I made no attempt to dispute it. But I reiterate, up-to-date, efficient, outdoor service to customers has a far greater influence. And it is a policy which is a most effective one for any administration to employ, to reduce the price of gas. Of course, an undertaking conducting its outdoor service on the lines advocated by me, and also selling gas at a low rate, should make more progress than a similarly conducted undertaking burdened with a high price per 1000 cubic feet; but I know of very few cheap-gas undertakings, and certainly none in the South-East of Ireland, where the outdoor service, so called, is worth mentioning. Possibly it is found that cheap gas may be left to sell itself, on the take it or leave it principle.

Referring to Mr. Lyne's figures relative to the make of gas per head of population of the different towns quoted by him—and this is the gist of the whole of his letter—accepting the figures as correct, if they prove anything at all, it is the fallacy of attempting to compare progress in different towns by such a method. Unfortunately for Mr. Lyne's argument, they show that low selling price of gas has no effect on make per head of the population. Cork and Dublin, with identical prices, show a difference of 20 per cent. in the make of gas per head; while Bangor, a small town of about 6000 inhabitants, selling gas at over 50 per cent. higher price than Belfast and 27 per cent. higher than Wexford, has a make per head of the population almost as large as Belfast, and 35 per cent. higher than Wexford. How can Mr. Lyne reconcile these facts from his own figures with the conclusions he draws? As to inferences to be drawn from the paper, provided they are logically drawn from it, Mr. Lyne or anyone else may draw what inference he pleases. If the cap fits, I can only say "wear it."

Mr. Lyne admits he has no knowledge of what has been done in the other towns he evinces such an interest in. Presumably he has some knowledge of what has been done in Wexford; and I would recommend him, when next rushing into print, to confine his remarks to matters of which he has some elementary knowledge. I cannot do better than compare Wexford's progress (taken from directory returns supplied by Mr. Lyne) with that at Waterford. Admittedly Wexford, with its huge engineering shops and many other factories, is one of the most progressive and prosperous towns in the whole of Ireland.

From 1901 and 1907 Directories.

Price of gas: Wexford, 2s. 10d. to 2s. 9d.; Waterford, 4s. 3d. to 3s. 9d.
Wexford, make of gas increased from 36 millions to 41 millions, or 5 millions.
Waterford, ,, ,, ,, ,, 65 ,, 81 ,, 16 ,,
Wexford, slot meters ,, ,, 50 to 80, or by 30 meters.
Waterford, ,, ,, ,, ,, 200 ,, 1056 ,, 856 ,,
Wexford, cookers on hire increased *nil* to *nil*, or by *nil*.
Waterford, ,, ,, ,, ,, 120 ,, 1058 ,, 938 cookers.

The significance of these statistics is that if Wexford, instead of relying solely on cheap gas, had conducted the outdoor department on modern up-to-date lines, as advocated by me, they would not now be crying out that the gas consumption was at a standstill. It is not, I hope, too late for them to mend their ways.

In Waterford the fittings turnover, exclusive of stoves on hire or goods supplied outside the city, amounted during the past five years to £8000. During the same period 103,640 mantles and 8317 incandescent burners were disposed of by the Waterford Gas Company, along with 45,000 mantles and 4100 incandescent burners supplied during the same time to other gas-works. Ten years ago, the minimum weekly consumption of gas was to the maximum weekly consumption 27 per cent.; in 1906 it had increased to 38 per cent.

When, nearly twelve months ago, invited by the President to contribute a paper to the proceedings, I acceded to his request, believing that such a paper as I read would be of interest to a large number of the members representing small undertakings. The number of letters I have received since the paper was published, asking for detailed information, is sufficient assurance, if any were needed, as to the merits of the subject dealt with; and I shall be more than repaid for any trouble involved in the preparation of the paper if it should prove instructive to Mr. Lyne.

JOHN G. TOOMS.

Waterford, July 4, 1907.

Self-Intensifying Gas-Lamps.

SIR,—In the very interesting paper read by Mr. H. E. Copp, at the recent meeting of the Institution of Gas Engineers, we notice that he says, in connection with the self-intensifying system of gas lighting, that—"depending, as it does, entirely on the length of chimney for its efficiency," &c.—certain defects come in under this system. Mr. Copp is evidently unaware of the existence of our self-intensifying lamp, which does not depend on an unsightly long chimney, but on the particular method employed to supply air to the burner, and also on the way air is projected on the mantle. By our plan, the evils he mentions are entirely avoided—especially the wear and tear of mantles.

Incidentally, our plan brought about an improvement that has proved very valuable—viz., that dust, smoke, and steam in the air have great difficulty in getting into the bunsen part of the burner, and so causing mischief to the burner and mantle. Much success in this direction has attended the use of our lamps, which have been fitted in many places where dust-proof bunsen burners were essential and where ordinary incandescents were not a success.

A. E. PODMORE AND CO.

Charles Street, E.C., July 6, 1907.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported, with amendments: Annfield Plain and District Gas Bill, Bude Gas Bill, Gas and Water Orders Confirmation Bill (No. 2), Leeds Corporation Bill.

Bills read the third time and passed: Brighouse Corporation Bill, Broadstairs and St. Peter's Urban District Water Bill, Portishead District Water Bill.

Bills Royal Assented: Basingstoke Gas Bill, Birmingham Corporation Water Bill, Boston Spa Gas Bill, Brockenhurst Gas Bill, Falmouth Gas Bill, Gas Companies (Removal of Sulphur Restrictions) Bill, Grays and Tilbury Gas Bill, Keswick Urban District Council (Water) Bill, Maidstone Gas Bill, Mitcham and Wimbledon District Gas Bill, Newquay and District Water Bill, St. Neots Urban District Council Bill, Shanklin Gas Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Broadstairs and St. Peter's Urban District Water Bill, Portishead District Water Bill.

Lords Bills read a second time and committed: Birkenhead Corporation Water Bill, Gas and Water Orders Confirmation Bill (No. 1).

Lords Bills reported, with amendments: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water Board Bill, Coventry Corporation Bill, Pontypridd Urban District Council Bill, Sheffield Corporation Bill, Tees Valley Water (Consolidation) Bill.

Lords Bills read the third time and passed: Southend Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill.

Exports of Gas Coal.

In answer to a question by Mr. Fell, the President of the Board of Trade (Mr. Lloyd-George) presented a statement showing the quantity of coal exported from this country for each of the months since the export duty was abolished, compared with the corresponding months of the previous year. The figures furnished were for anthracite and for steam, gas, household, and other sorts of coal; but we give only those for gas coal.

	1905-6.	1906-7.		1906.	1907.
Nov.	590,832	714,531	March	77,837	116,638
Dec.	570,721	628,543	April	678,605	821,674
Jan.	90,685	113,511	May	111,864	147,485
Feb.	551,840	669,407			

KINGSTON-UPON-HULL CORPORATION BILL.

House of Lords Committee.—Thursday, July 4.

(*Before the Earl of* DONOUGHMORE, *Chairman; the Earl of* ABINGDON, *Lord* INCHIQUIN, *Earl* KENMORE, *and Lord* SUFFIELD.)

The object of this Bill is (among other things) to authorize the Corporation to acquire the undertaking of the East Hull Gas Company.

The Hon. J. D. FITZGERALD, K.C., Mr. RAM, K.C., and Mr. JEEVES appeared for the promoters (with Messrs. Sharpe and Co., as Agents). The Bill was opposed by the East Hull Gas Company, who were represented by Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. PADDON; while Mr. MOON, K.C., and Mr. LAWRENCE appeared for the North-Eastern Railway Company.

Mr. FITZGERALD, in opening the case for the promoters, remarked that the Bill was divided into two portions. The only part opposed was that relating to gas; and this was the only part that he proposed to deal with. Until recently the City of Hull was supplied with gas by three Companies. The old City of Hull was until recently supplied by the Kingston-upon-Hull Gas Company. In 1897, the Corporation obtained an Act under which they acquired the undertaking of this Company at an agreed price of £92,500. The transfer took place in 1898; and since then they had been supplying gas within the City. Gas was supplied by the old Company at 3s. per 1000 cubic feet; but the Corporation had been able to reduce it to 2s. 6d. The works of the old Company were most inconveniently situated in the centre of the old town of Hull, without any facilities for getting coal cheaply. It was always the intention of the Corporation to dispense with these works, and use them for the improvement of the town. The Act of 1898 enabled them to get a supply of gas in bulk from either of the adjoining Companies; and arrangements were made with the British Gas Company by which that Company supplied them in bulk at the price of 1s. 6d. per 1000 cubic feet—they distributing the gas and bearing the expense of distribution and managing the entire gas supply. The whole result had been very satisfactory. It had been for many years the intention of the Corporation also to acquire the undertaking of the East Hull Gas Company. The opportunity came last session. Up to that time, the East Hull Company was known as the Sutton, Southcoates, and Drypool Gas Company, when they changed their name. Last session their capital became exhausted, and they were obliged to come to Parliament after a lapse of forty years. The Corporation opposed the Bill upon the ground that they desired to take over the undertaking, and that no further powers ought to be conferred upon the Company, except on the basis that the Bill was to be heard this session and not to be prejudiced. The Bill was heard before a Committee of the other House, who decided that they were prepared to pass the preamble on two conditions—one being that a purchase clause, on the lines of the Merthyr Tydfil clause, should be inserted. The main object of the Bill of last session was to authorize the Company to raise additional money; the whole of their original capital having been expended. The East Hull Gas Company was originally started as a joint-stock undertaking, or non-statutory Company, as long ago as 1846. In 1867, they were incorporated as a statutory concern. At that time the capital was £24,000; and the whole of this had now been spent. By the Act of 1867, the Company were authorized to raise a further sum, by way of new capital, of £76,000; making a total of £100,000 in all, with a maximum dividend of 7½ per cent. The Company had always paid this maximum dividend from the year 1867 down to the present time. They were authorized under their Act to issue their new capital under the auction clauses, which were made compulsory by a Standing Order in both Houses of Parliament about 30 years ago. Prior to that time, it had been the custom, both of gas and water companies, when their stock was at a high premium, to issue new stock to their shareholders at par. In many gas companies, the £100 stock stood at £150 or £160, and even as much as £200; and they issued their new stock as required at par to the existing shareholders, who received not merely the maximum dividend which the stock was entitled to, but also a very large bonus in the shape of 50 or 60, or even 100 per cent., for which they paid nothing. But prior to the date when the Standing Order was introduced and made compulsory upon all gas and water companies coming to Parliament afterwards, various gas companies had obtained in their Acts authority to issue their capital by auction in the same way. This Company was one of them. If the whole capital had been issued under the auction clauses, the Company would have been able to pay their maximum dividend, and could have supplied gas at 2½d. per 1000 cubic feet less than at present. The shareholders were getting their 7½ per cent. They could not get any more; and when they had been for a number of years in this position, the whole management of the Company was characterized by want of enterprise or dead-alive management. They had no interest in pushing the business. Although there had been a great opening for the supply of gas by prepayment meters, the Company had not availed themselves of it until this Bill was threatened. The consumers in the Company's district were only 40 per cent. of the inhabited houses; whereas in the British Gaslight Company's district they amounted to 73 per cent. of the inhabited houses, and in the district supplied by the Corporation there were more consumers than inhabited houses. From 1900 to 1906 the East Hull Gas Company supplied gas at 2s. 6d. per 1000 cubic feet. But when the opposition of the Corporation to the Bill of last year was announced, they reduced the price to 2s. 4d.; and when the Corporation decided to promote this Bill, the Company immediately reduced the figure to 2s. Their accounts showed that at this price they could not earn the necessary revenue to pay their maximum dividend. The reduction was made not as a business transaction, but so as to enable them to come before the Committee and say: "Why should this undertaking be transferred; we are supplying gas about the same price as the British Gaslight Company, and lower than the Corporation are?" But if the Bill were to pass, they would be compelled, if they wanted to go on paying their maximum dividend out of revenue, to put back the price to 2s. 4d. or 2s. 6d. The South Metropolitan Gas Company had been obliged to put up the price of gas because coal had gone up. One of

the best tests of good management of a gas company was the amount of unaccounted-for gas. In the case of the British Gaslight Company, this was 2·7 per cent. of the whole; in the case of the Corporation, it was 3·1 per cent.; and in the case of the East Hull Company, it was 7·9 per cent. The Corporation submitted that the time had now come for the transfer to be made. In their hands, the Corporation would raise the capital as Corporation stock—say, at 3½ or 3¾ per cent.; whereas the Company would have to raise it as gas capital, at about 5 per cent. There was no opposition to the transfer, excepting from the Company. The Local Authority in the district were supporting the Bill; a clause having been agreed with them. Dealing with the petition, Counsel said they contended that the Corporation proposal was unjustifiable and unprecedented, and that it was in reality a municipal trading scheme to be utilized as a means of making profits to be applied to the reduction of municipal rates. The only other petition—that of the North-Eastern Railway Company—was purely a clause question.

Mr. *F. J. Bancroft*, the Gas Engineer to the Hull Corporation, was then called. He said that the relative output of the three undertakings was: The British Gaslight Company, for the year ending December, 1905, supplied 1123 million cubic feet; the East Hull Gas Company, 177 million feet; and the Hull Corporation, 86 million. In 1867, the Company were authorized to issue further capital up to £76,000, which was to be of the nominal value of £10 per share, with a maximum dividend of 7½ per cent. A £10 share bearing such a dividend could have been sold by auction for £15, so as to return to the purchaser 5 per cent. In May of last year, when the Corporation opposed the Company's Bill, they reduced the price of gas; and in November there was a further reduction, which was not justifiable. If the undertaking were transferred, the Corporation would be able to effect economies, and the result would be generally satisfactory.

Mr. *E. H. Stevenson* said he had been over the works of the East Hull Company. The transfer of the old Kingston Company to the Corporation was beneficial to all concerned. The old Company were under no regulations whatever; and since 1824 they had never been to Parliament. They were selling gas of any quality they liked, and at any price, and dividing any profits they could earn. The profits divided were over 22 per cent.; but the profits earned were considerably more, and went in extension of the business. With regard to the East Hull Gas Company, the published accounts showed that when they came to Parliament they had overdrawn more than £7000; and the capital expended was more than the capital authorized in 1903. The shareholders could not in the future be in a better position than they were at the present time, since they were receiving maximum dividends. Therefore the time was very opportune for the transfer to be made to the Corporation.

Friday, July 5.

Mr. *Stevenson* resumed his evidence this morning. He said the district supplied by the Company was situated on the east of Hull, where there was every possibility of considerable growth in the population. It was a commonly accepted fact that if two moderate-sized undertakings were amalgamated, they could be worked more economically than if they were run as separate concerns. In nearly every case of purchase by local authorities the consumers had received benefit by a reduction in the price of gas, and the general body of ratepayers had also benefited by surplus profits being used in aid of the rates. The few cases which witness knew in which the price had been raised had all been undertakings which were transferred by agreement, without the price being settled by arbitration. It appeared, therefore, that where prices of undertakings had been arranged between the company and the local authority, there was more probability of the corporation paying a larger sum than the true value of the concern than where an arbitration took place and the price was settled by independent people. There were few places which showed that a loss had been suffered after paying all interest and sinking fund. Generally speaking the transfer of gas undertakings had benefited all parties. Gas companies bought out by arbitration had always received the full value of their property, although they did not generally receive what they asked for. The East Hull Company were a maximum price and maximum dividend concern, and therefore no improvements in manufacture, and no reduction in the price of gas, would enhance the value of the stock in the slightest degree. The dividend could not be increased, neither could the security of the holding. They had not in the past acted in the best interest of the consumer. In the event of the combination of the two undertakings, the cost of production and the working expenses would be considerably less. If the shareholders were compensated with the full market value of their shares, they could not reasonably say that it was unfair. The first reduction in the price of gas which the Company made was justifiable. With regard to the following reduction to 2s., however, he could only say that they would be unable to maintain their dividend at that price. But although this price was too low, he was of opinion that they could, and should, have made a reduction some time before they did, because in previous years there was a considerable surplus of revenue. All the Corporation asked for was that they should be allowed to become the gas purveyors in the district on fair terms; and they would pay the Company the full value for their undertaking.

Mr. *Charles Hunt*, in giving evidence, said the area of the Company's district of supply outside the City was of considerable extent, but contained a population of only 1400 or 1500; the number of inhabited houses being 323. At present, it was anomalous that the gas supply of any place having a single municipal authority should be in more hands than one. In cases where gas companies had been acquired by corporations, satisfaction had almost invariably resulted both to the consumer and the ratepayer. In very few instances loss had resulted; but in the great majority of cases, the price of gas had been reduced. In the present instance, it was clear that there would be immediate benefit to the consumer. The Board of Trade returns for 1905 showed that the total capital indebtedness on gas-works account of the local authorities owning gas undertakings, after the deduction of sinking funds, was at the rate of £471 per million cubic feet sold, as compared with £712 in 1882. They also showed that the capital of gas companies had increased during the same period from £724 to £840 per million cubic feet sold. The latter figure was largely attributable to stock conversion by many of the companies, by which 10 per cent. or 7 per cent. stock had been converted into a larger amount of stock bearing a lower rate of interest; but as the local authorities had usually had to pay large sums for goodwill, the comparison held good. The management of gas undertakings by corporations had been quite as satisfactory as those managed by companies; and he saw no reason in the circumstances at Hull why the city should prove an exception to the general rule. The fact that only 40 per cent. of the inhabited houses in the East Hull Company's district were consumers of gas, and that although the district was increasing the supply had only been increased by 36 per cent. in ten years, pointed to want of enterprise on the part of the Company. If the transfer were made, some £13 000 would be necessary to put the works in order and to make satisfactory arrangements to meet the requirements. He was sure there would be a decrease in the administrative costs.

Mr. *T. R. Ferens*, M.P. for East Hull, considered that it would be an advantage to the East Hull district, and to the City of Hull, if the powers sought by the Corporation were conferred upon them. He believed the Corporation would make the undertaking a success.

Alderman *Larard*, a member of the Hull City Council, expressed himself strongly in favour of the Corporation taking charge of all the gas undertakings there were. If this undertaking were now given over to them, it would be well and economically managed. The reduction which they had been able to make in the price of gas charged by the old Kingston Gas Company had been equal to a benefit to the ratepayers of between £11,000 and £12,000.

Mr. BALFOUR BROWNE then briefly addressed the Committee on behalf of the East Hull Company, contending that no case had been made by the promoters and that there were no complaints as to the management of the Company.

The CHAIRMAN then shortly consulted with his colleagues without clearing the room, and announced that the Committee were not prepared to proceed with this part of the Bill.

There being no opposition to the rest of the measure—the appearance of the North-Eastern Railway Company being a matter of clauses relating to gas matters—the clauses were finally adjusted.

METROPOLITAN WATER BOARD (VARIOUS POWERS) BILL.

(*Before Viscount* CROSS, *Chairman*, *Earl* BATHURST, *Earl* MANVERS, *Lord* ABERDARE, *Viscount* HILL, *Sir* J. RANDLES, *Mr.* ROSE, *Mr.* WHITBRED, *Mr.* DUNCAN, *and Mr.* LUKE WAITE.)

The Joint Committee of the Houses of Lords and Commons, constituted as above, commenced the consideration of this Bill on Thursday, the 13th ult.

Mr. FITZGERALD, on behalf of the Board, explained that this was in the nature of an omnibus Bill dealing with a variety of matters in respect of which the Metropolitan Water Board desired to obtain further powers. It was divided into parts; and following the usual course in Bills of this character, he asked the Committee to postpone Part I., and begin by taking Part II., which could be dealt with by itself. The first work that was proposed under this part was a tunnel under the Thames at Richmond, just below Richmond Bridge. The reason for the tunnel was that it was necessary to safeguard the supplies of water to the western portion of London. At the present time there were two 36-inch mains, trunk mains, from the West Middlesex intake at Hampton to their reservoirs at Barnes, and these crossed beneath the Thames just below Richmond Bridge. Close to them were two other trunk mains (36 inches and 30 inches respectively) that were formerly laid by the Southwark and Vauxhall Company, and which passed under the Thames at this point. They were constructed of cast iron; but the Board were advised that if one of these mains burst, it might involve the bursting of the other, and create a most unfortunate situation. They were also advised that an accident to one of the West Middlesex mains might affect the other. Under these circumstances, they proposed to make the tunnel there and to put into it the four mains which now passed under the river. The estimate for doing this, including the necessary loans, was £35,400. They had arranged terms with the Corporation of Richmond, who were the owners of a small island in the river at that point (known as "Corporation Island"), and on which it might possibly be necessary to make a boring or construct some works. They had also arranged terms with the landowners on each side whose land was to be taken; and as far as he knew there was no opposition to the construction of the tunnel. The next works to construct were three lines of pipes or tracks, described in the Bill as so many conduits. The first track (Pipe-Track No. 1) was described in the Bill as Conduits 1 to 5; and it was for the purpose of taking a 30-inch main from Hampton to Hanwell, in order to give an increased and better supply to the whole of that district. A considerable part of this line of track was either under public roads or on land that already belonged to the Board; and where the main had to be laid under public roads the Board had already sufficient power under the Water-Works Clauses Act (the whole of the district being within the water limits), and they only required parliamentary authority where they had to lay the main under private lands, and for this purpose either to acquire the lands or an easement under them. The next line of pipes (Pipe-Track No. 2) commenced at Walton, and ran from there to the Rammey Marsh Well, and from there to the reservoir which was authorized in 1900 in the hands of the East London Company, and which was now about to be constructed. The object of this pipe-track was to get the surplus water from the well at Rammey Marsh and take it to the new reservoir when constructed. The last line of track was represented in the Bill by Conduits 9 to 23; beginning at Ditton, and carried from there to the present Norwood reservoir. In connection with this, it was proposed to construct a further reservoir by the side of the Norwood reservoir, to give additional storage there for the supply of the district. The conduits described in the Bill were merely the conduits for which parliamentary powers were required. There was also a new road mentioned in the work which was to have been constructed at Wandsworth; but this had been withdrawn—the

Wandsworth Borough Council having objected to it. Clause 25 in this part of the Bill gave power to the Board "to purchase by agreement, or take on lease, and acquire for the purpose of protecting from pollution any sources of water supply, or for any other purpose of their undertaking, any lands not exceeding in the whole 500 acres; but nothing in this section shall authorize the Board to create or permit the creation or continuance of any nuisance on such lands." He thought the only objection taken to this clause by the opponents was that it was suggested that it would be open to the Board to acquire lands, and then, without any parliamentary authority, to sink wells upon the lands and proceed to pump large supplies of water from them. To meet this objection, they proposed to add a proviso prohibiting the Board from using the lands to be acquired for the purpose of pumping water for a public supply.

After remarks from various Counsel on behalf of petitioners against the Bill, the consideration of this clause was postponed.

Mr. *W. B. Bryan*, the Engineer to the Water Board, stated, with regard to Part II. of the Bill, that he was generally responsible for preparing the works; and they were all necessary for the proper carrying out of the undertaking. The tunnel under the Thames near Richmond Bridge was for the accommodation of two 36-inch mains supplying the north side of the river, and one 30-inch main and one 36-inch main to supply the south of the river. In regard to the danger which he anticipated, and to remedy which they wanted the tunnel, in cases of existing mains crossing the bed of the river accidents had happened, necessitating perhaps as long as six or eight months before the repairs could be properly effected. Consequently, a main had been out of use the whole of that period. By putting them in a tunnel such difficulties were done away with, and repairs could be executed immediately. This affected both sides of the river. There was no engineering difficulty about the work; and they had settled with all the parties who were interested.

Witness was further examined in detail, and was then cross-examined on behalf of local and county authorities, railway and tramway companies, and others.

Mr. *J. W. Restler*, the Deputy Chief Engineer to the Board, also gave evidence, and the clauses of Part II. were gone through, and certain points of difference adjusted; the witnesses being re-called and cross-examined.

Objections of landowners were put forward to the part of the Bill relating to the extension of time by seven years for the construction of a reservoir at Norwood. To meet local objections, the original plan had been revised; the area of the reservoir being curtailed by 36 acres and the bank raised by 8 feet.

On the resumption of the proceedings on the 18th ult.,

Mr. *Bryan* stated, in cross-examination respecting the proposed Island Barn Farm reservoir, that he was the author of the altered scheme, but not of the original one. He approved of the site which had been selected, and thought it an excellent one. He admitted that a small portion, along the River Ember, was liable to flooding. Both banks of the river were flooded. He had modified the scheme by reducing the area of the reservoir by 26 acres. With regard to Walton, that district was at present supplied by the West Surrey Water Company; and therefore the proposed reservoir, so far as water supply was concerned, would be of no benefit to it. The whole of the Mole Valley was very subject to flooding. The reservoir would to some extent hold up flood water in flood time; but it would be so minute as to be inappreciable. The modifications in the construction of the reservoir were made by reason of interviews with the Surveyor of the East and West Molesey Council. The Council wanted the Board to contribute to the cost of making a weir. He objected to the Board relieving the District Council of any portion of their proper obligations.

In re-examination by Mr. FITZGERALD, witness stated that since the Water Board came into possession of the Lambeth undertaking, they had found great difficulty in supplying the whole of the area. The district was increasing more rapidly than any other—at the rate of 25,000 persons per annum. It was a large district extending down as far as Croydon; and the reservoir was essential for the supply. The alterations did not increase the danger of flooding.

Mr. *Restler* (recalled) agreed with Mr. Bryan's evidence. He thought it absolutely necessary that the reservoir should be constructed. Without it, if the Thames Conservancy exercised their powers, the Board would be unable in the summer time to take the supply necessary for the district from the Thames. The alteration proposed in the original scheme would very materially diminish whatever chance there might have been under the old scheme of increasing the difficulties of the water getting away, because the lowest part of the Island Barn Farm was intended to have been raised, under the 1900 Act, 3 feet; and this would practically have thrown all the water to the northward on the north side of the reservoir into the Mole, and towards the bank which already existed on the northern side. The present average level of the ground was higher than the bank which had been made for the protection of the district.

Mr. *W. Vaux Graham* gave it as his opinion that the construction of the proposed reservoir would not have the effect of increasing the floods in the Mole to any measurable extent.

After witness had been cross-examined,

Mr. FREEMAN announced that this concluded the case for the promoters on this part of the Bill.

Evidence was then given by Mr. *G. R. Strachan*, Mr. *J. Stevenson*, the Surveyor to the Molesey Urban District Council, Mr. *H. C. Fread*, the Engineer and Surveyor to the Urban District Council of Esher, and Mr. *G. Chatterton*, on behalf of the Walton District Council, the East and West Molesey District Council, &c., to the effect that the construction of the reservoir would increase the danger of flooding to Molesey and to the Walton sewage farm.

Mr. LEWIS COWARD then opened the case in support of a petition against the Bill signed by eighteen gentlemen who had resided in the district of East Molesey for a large number of years. The petition represented in value estates certainly worth not less than £150,000 to £200,000. The estates came up to the land on which the reservoir was proposed to be constructed. The Committee were asked to extend the time for the construction of the reservoir; for in six weeks' time the powers expired altogether. Since 1900, the promoters had done nothing; so that the position before the Committee to-day was one of seeking to revive powers, and for these revival powers Parliament had always insisted on the strongest possible evidence. The offer to diminish the area of the reservoir by some 26 acres did not meet his objection any more than it met that of the District Councils. The Committee would hear from his witnesses that the Rivers Mole and Ember were absolutely independent, and always had been independent, of the question of the Thames floods. That was not what they feared. The witnesses would say that the whole of the Island Farm in time of floods was very nearly under water—that it was a sea of water. Above all, he wanted to impress on the Committee that the Island Farm contained important elements for the preservation of the whole of his clients' surrounding properties. Until this reservoir had been authorized, neither directly nor indirectly had his witnesses any knowledge whatever of what was going to be constructed at their gates. Mr. Bryan had suggested that the reservoir would shut out the sewage works of the Walton District Council, which were three-quarters of a mile away, and another sewage works which were no less than a mile-and-a-half away from the houses notably of Mr. Francis and Mr. Barnard, whom he would call.

Evidence was then given in support of the petition by Mr. *C. K. Francis*, Metropolitan Police Magistrate, of East Molesey Court, Mr. *E. K. Burstal* (who said the reservoir would cause additional flooding to the land because the greater part of the Island land was under water in flood times), Mr. *A. A. Barnard*, of "The Wilderness," East Molesey, Mr. *R. Cobb*, of "The Grove," Esher, and Mr. *L. H. Raw*, who lives on the north side of the River Mole.

Mr. FREEMAN, for the Board, said they were dealing with a reservoir which was sanctioned in 1900, and from the proceedings which then took place it was evident that at any rate most of the local authorities and landowners knew of the proposals, petitioned against the Bill, and appeared on the proceedings. The whole matter was then gone into thoroughly; and Parliament sanctioned the work being carried out. Had it not been owing to the peculiar circumstance that the Water Companies were purchased, the Lambeth Company could have made this reservoir and nobody could have said a word about it. It was only by an accident that they had to come and ask now for an extension of time to carry out the work. Strictly speaking, he did not think most of the petitioners would have been entitled to be heard; but the Board were very desirous of meeting the local authorities and everybody as far as they could. The whole point of the opposition was really to try to get the Board to carry out improvements in these rivers, which the local authorities, although they knew that the place was liable to flooding ever since 1878, had never spent one penny upon.

After a consultation,

The CHAIRMAN announced that the Committee were unanimously agreed that this extension of time should be granted as proposed (seven years). He then said there was a report from the Board of Agriculture on clause 42: The Water Board ask for confirmation of purchases of common land which appear to have been made by the East London Water-Works Company without statutory authority, and to be now vested in the Water Board, and for the extinguishing of the common rights affecting the lands. The Company were authorized by the East London Water-Works Act, 1900.

Mr. *A. B. Pilling*, the Clerk to the Board, having given evidence on the point which was satisfactory to the Committee,

Mr. BOYCE, for the Local Government Board, on clause 48, said he did not know why their suggestion should not be accepted. It had been accepted in a great many cases, and it was very customary that where their consent was now required it should be continued to be required. They suggested there should be the proviso added that "Nothing in the clause should be taken to dispense with the necessity of obtaining their consent to any alienation, lease, or other disposition of lands for which such consent would be required but for the provisions of the Bill." It was a very common practice to add such a proviso as this; and he did not see why they should not have it in the Bill.

Mr. FITZGERALD remarked that this placed the Water Board in an extreme difficulty.

Witness proceeded to explain, as to the necessity of the clause, that under the Water Board's existing Act of 1902, they had power to lease lands, and so on, with the consent of the Local Government Board. Now the Water Board's estates, lands, houses, &c., represented a rent roll of some £13,000 odd per annum, and some 1250 tenancies. The result of the section in the Board's present Act of Parliament was this: If they desired to let a cottage, even at 5s. a week, they had to make an application to the Local Government Board for their sanction to this particular transaction, and the matter could not be completed until they got it. Such a course was naturally extremely inconvenient and led to a great deal of delay; and all that the Water Board asked was that they might be given powers which were commonly possessed now by local authorities of managing their lands without having in every case to go to the Local Government Board for their consent.

Mr. BOYCE said that witness had not dealt with the suggestion which the Board made as regarded terms not exceeding seven years.

The CHAIRMAN said that if Mr. Fitzgerald accepted the Board's suggestion, he would get a lease for seven years, which would avoid trouble.

Mr. FITZGERALD promised to bring up a sub-clause on the subject.

A number of clauses were then dealt with and amended.

On the resumption of the proceedings on the 19th ult.

Mr. *A. B. Pilling* was examined by Mr. FITZGERALD with reference to clause 64. He stated that it gave power to the Board to provide, fix, and maintain meters, and to charge for them; and it also set forth that the Board should not be under any obligation to supply water by measure otherwise than through a meter or other instrument provided, fixed, or approved by them. While they took power to provide and fix meters, and to charge a rent for them, they did not confine the user of the meter to meters provided by the Board, but only to meters either provided or approved of by them. Under the Charges Bill, recently before the Committee, trade supplies were in future to be obligatory on the Board. There would therefore no longer be an opportunity for the

Board to introduce the meter protection in that Bill, so they sought it in this one. What they wanted to provide against was a meter being used that would not properly record the amount of the water supplied—in fact, at the present time the meters employed were almost invariably those supplied by the Board. A trader or any other person receiving a supply of water could use a meter of his own, provided it was approved by the Board.

Mr. PAGE, on behalf of the Railway Companies, accepted the words as to the approval by the Board.

In cross-examination by Mr. COWARD, witness denied that the Board proposed to have a monopoly in regard to the manufacture and supply of meters. The clause in the Water-Works Clauses Act, 1863, simply gave power of inspection; and they wanted a more direct control over the meter.

Mr. BANNATYNE, for the Home Office, stated that the sole objection they had to the proposal was that it left absolutely unfettered discretion to the Board to reject any meter. Their contention was that the Board should be required to approve any meter that conformed to specified requirements. These requirements might be stated either in regulations or, as in the Model Clause, in bye-laws; and the Home Office also asked that these bye-laws or regulations should be subject to the approval of a public department. He pointed out that this recommendation was based on the provisions of the Model Clause No. 14 of the Model Bills and Clauses.

Mr. COWARD submitted that the Model Clause was sufficient.

Mr. FORBES LANKESTER said that, on behalf of the City of London, they took somewhat the same view. They saw no reason for departing from the precedent of the Model Clause; and they would ask the Committee to adopt that clause.

Mr. FITZGERALD said that if the Home Office thought that there ought to be a power in the clause for the Board to make regulations subject to the approval either of the Local Government Board or of the Home Office, and where the meters were in accordance with those regulations the Board should approve them, he did not think there would be any objection to this; and the clause might be amended in that form. He would assent to an amendment of the clause in this way—it being understood that the Board had authority from time to time to inspect the meters. He proposed to add the following words: "Or approved by the Board, or which shall comply with any regulations of the Board as to the size or the construction, removal, user, and replacing of meters, which regulations they are hereby empowered to make, under and subject to the terms and conditions contained in the Metropolis Water Act, 1871."

Mr. BANNATYNE said that would meet the point of the Home Office.

Mr. BRYCE remarked that there ought to be some middle course.

After further discussion,

The CHAIRMAN announced that the clause, as amended, would stand part of the Bill, as follows:—

The Board shall not be under any obligation to supply water by measure otherwise than through a meter or other instrument so supplied provided and fixed or approved by the Board, or which shall comply with any regulations of the Board as to the size, nature, construction, testing, removal, user, and replacing of meters, which regulations they are hereby empowered to make under, and subject to, the terms and conditions with respect to regulations contained in the Metropolis Water Act, 1871. Provided that nothing in this section shall authorize the Board to refuse to supply water by meter until such regulations have come into operation.

Mr. FITZGERALD, dealing with another Home Office objection to clause 76, explained that the clause provided that, in case of an appeal or other legal proceeding, the Board should not be required to enter into a recognisance, and that

such requirement shall be deemed to be satisfied on the entry of appeal or undertaking of such proceeding by the Board. But in every such case the Board shall be liable as if recognisances had been entered into for such sum, if any, as is required by such Act or rules in case of any such appeal; and all entries of appeals or other proceedings shall be made and taken as if recognisances had been so entered into.

Witness, in explaining the difficulty and inconvenience that arose in cases of appeals and recognisances, illustrated it by referring to the appeals now proceeding against the rating in the City of London.

Mr. BANNATYNE said his objection to the proposal was based chiefly on general grounds; but there was a particular objection to which they called attention in their report. The general objection was that this was an alteration of the general law as to legal procedure in this country in favour of a particular body; and they submitted that this was a matter for a Public Act and not for private legislation.

Mr. FITZGERALD admitted that it was an alteration in procedure, but not an alteration in the law.

After further discussion,

The CHAIRMAN said the Committee would allow the clause to stand.

Clause 80 was one to enable the Board to

Lend temporarily upon the security of any stock, bonds, bills, or other properties in which Trustees are by the "Trustee Act, 1893," authorized to invest, or upon the security of Treasury bills, India bills, London County bills, Metropolitan Water Board bills, or certificates to bearer relating to stock in this section referred to, to any person or persons any sum of money which the Board may have in hand, provided (*a*) that no such loan shall be advanced for a longer period than three months, (*b*) that the aggregate of such loans outstanding at any one time shall not exceed £1,000,000, (*c*) that the Board shall, with the consent of the Local Government Board, determine the percentage by which the value of the securities required from borrowers shall exceed the amount of the loans advanced.

Lord *Welby*, the Chairman of the Finance Committee of the Water Board, explained the desirability of the powers sought under the clause.

After cross-examination and discussion,

Mr. FITZGERALD undertook to exclude any moneys forming part of the sinking fund or redemption fund; and the clause was ordered to stand over for the drawing up of words to cover the point.

Evidence having been given concerning the Sutton Water Company, the Railway Companies, and the Twickenham and Hampton Urban District Councils, on a new clause dealing with works, mains, &c.,

The CHAIRMAN said the Committee were agreed that the clause might be passed; but, of course, the Water Board would remember there was compensation that might be got if they made any mistake under the provisions of the Public Health Act, section 308, which gave protection to both railways and local authorities.

Mr. FITZGERALD said it was intended that this section should apply, and the same provisions with regard to compensation covered the case of the tramways.

Parts of the Bill dealing with superannuation funds for employees, &c., that had been left over for alterations to be made to meet the views of the Local Government Board, were next dealt with, and some other clauses were brought forward and amended.

Mr. FREEMAN, when the proceedings were resumed on the 20th ult., brought up a clause dealing with the recovery of rates, as follows:—

Proceedings for the recovery of the water-rates shall be for all purposes deemed to be proceedings for the recovery of civil debts, and notwithstanding that a period of more than six months has elapsed from the time when such water-rates became payable, the same may be recovered in a summary manner.

Mr. BOYCE, for the Local Government Board, objected to the words "notwithstanding that a period of more than six months has elapsed," submitting that there was no excuse for altering the general law in this case.

Mr. *Pilling* explained that, under the Water-Works Clauses Act of 1847, water-rates were payable quarterly in advance. It was, however, extremely inexpedient to send the collectors round every quarter; and therefore the custom was to make the collection half-yearly. The demand note was sent out in the middle of the half year. The result was that at the time the demand note went out the first three months' rate was already three months in arrear; and as the law limited them in the Police Courts in the recovery of these rates to six months, three months had elapsed before the demand note went out. They simply asked that the six months' limit be no longer imposed upon them. He proposed that the Board should come under the ordinary Statute, which would give them six years.

Mr. BOYCE submitted that there was no justification whatever for altering the general law as to the charges, because the summary power was an addition to the other powers in the County Court.

Mr. FREEMAN, replying to the Chairman, said the words he proposed were twelve months.

Mr. LUKE WHITE (a Member of the Committee): I think we should not alter the general law in a Private Bill,

The CHAIRMAN: The Committee are agreed that the general law is quite sufficient.

The clause was therefore struck out.

Clause 77, as to the making of contracts on behalf of the Board, gave them the same power as is given to companies under the Companies Act of 1867.

Mr. BOYCE objected on behalf of the Local Government Board, remarking that this involved a material alteration, as regarded the Water Board, of the general law relating to contracts made by corporate bodies—such contracts as a general rule being required to be made under the seal of a corporate body. "If the Committee are satisfied that the law in this matter, as applicable to the Water Board, requires alteration, the Board suggest for consideration whether the provision should not be limited to contracts below a specified amount or value." Then they gave the two precedents. At present the Water Board were subject to section 149 of the Metropolis Management Act, 1855, which involved the sealing of contracts exceeding £10; and the London County Council and other authorities outside London were subject to the section of the Public Health Act which involved sealing every contract of over £50. He was bound to say that, in his view, the £10 was probably too low in the case of London, because £50 was allowed outside. But he submitted that the general law ought not to be altered; and if any alteration was made, that the provision should be limited to contracts exceeding a specified sum.

Witness said the question of the purchase of goods by a body like the Water Board was not a case of £50 per contract, it was more like £5000; and the seal was then invariably used. But in these small questions things had to be done out of hand; and all the clause did was to say that where ordinary individuals might contract with each other without the use of a seal, so the Water Board might do.

Mr. BOYCE pressed upon the Committee that by this clause they would alter the law of contracts which applied all over the country, quite apart from the contract for goods. If the Committee wished to increase the limit, his suggestion was that, instead of having contracts of £10, the Committee should fix the limit and insert £50 instead of £10. So that the law as at present applicable would still apply to them; but the limit would be extended.

The CHAIRMAN, after the matter had been allowed to stand over for settlement as to the insertion of the figure, said it was proposed after the words "any contract" to insert the words "whereof the value or amount does not exceed £50, or any tenancy agreement whereby the rent reserved shall not exceed £50 per annum."

Mr. FORBES LANKESTER brought up a new clause for the City of London, the object of which was to oblige the Board, when they laid down a new pipe or main, or altered the position of an existing pipe, to put it in the existing subways which belonged to the City, and not lay it in a trench made for the purpose by the Board themselves.

Mr. FITZGERALD having objected that this clause did not arise upon the Bill, he asked the Committee to reject it; and the matter was allowed to stand over for a time.

Mr. BALFOUR BROWNE brought up a clause on behalf of the London United Tramways Company; but after legal arguments,

The CHAIRMAN said the Committee thought the tramways were amply protected as the law stood, and the clause was not wanted.

An agreed clause for the protection of Middlesex was added to the Bill.

Other new clauses were brought up and discussed relating to the Southall Urban District Council, and the Hampton, Hampton Wick, Heston and Isleworth, and Teddington and Twickenham District Councils.

Mr. CLODE, on resumption of proceedings on the 25th ult., brought up a long clause on behalf of the Railway Companies for their protection, putting upon the Board, among other things, obligations to carry out works and alterations under the Bill to the satisfaction of the

Companies concerned, without interfering with traffic, and to compensate them for any loss or damage arising. The promoters, he said, had told them that they could have protection if they withdrew from the Committee and did not claim their rights; but having, as he argued, come to a definite agreement with the Water Board officials, they were not going back. They adhered to their clause, the bulk of which he contended had been agreed.

Sir *Charles Owen*, the General Manager of the London and South Western Railway, said he had carefully studied the clauses proposed for the protection of the petitioning Railway Companies, who were, in effect, all the Railway Companies in London, except certain underground railways.

Mr. PAGE: With regard to the first five clauses, is it necessary that the Companies should have the protection mentioned in those clauses, so that in constructing, laying down, altering, or improving, or extending any conduits which go across, along, or under a railway, or affect the structure of any bridge which the Companies are liable to maintain, that work shall be done to the satisfaction of, and under the superintendence of, the Railway Companies?

Witness: It is absolutely necessary that such a clause should be given to the Companies in order that their engineers may protect and secure the safety of the public.

And is it fair, in your opinion, that all such works should be done at the expense of the Board?—That only follows the ordinary course observed in such matters.

Continuing, witness said it was equally reasonable that they should make good and restore any property and works of a railway company, and works which it was absolutely necessary to maintain throughout any alterations, in such condition that the traffic could be continuously and regularly maintained in the interests of the public. It was absolutely necessary that the Board should be bound not to do anything which would interrupt or delay the safe passage and conduct of the traffic on the lines.

Mr. FITZGERALD, replying to the Chairman, said he had no objection to many of the sub-sections of the clause, which did not carry the Railway Companies a bit farther than the general provisions of the Act of 1875. The point he took was that they were only placing themselves in the same position as every water authority throughout the country; and with regard to the specific works in this Act, they had already agreed with Sir Charles Owen, or his representative, a specific clause protecting the Companies.

Mr. PAGE protested against the action of the Water Board in the matter, asserting that he could prove that an absolute agreement was come to.

In cross-examination by Mr. FITZGERALD, witness said they simply required the retention of the full user of their property for the purpose for which they had purchased it. They were complaining of the broad powers given to the Water Board under the Bill, which made it a local authority with power to carry on general works without coming to Parliament in each individual case, and without coming for specific powers.

Mr. *C. L. Morgan*, the Engineer to the Brighton Company, said the Water Board had agreed no clauses whatever with them. The Company would be affected if the Board exercised the power asked for by the Bill, of crossing their line. For this purpose it was absolutely necessary that there should be a provision that they might take, at the Company's option, an easement instead of taking the land. They thought that any additional expense which the Company reasonably incurred by the user of their railway and land which they had for railway purposes, should be borne by the party causing the obstruction. The Board claimed power at any time to lay down new mains, and in any position. They might choose to lay them down at an inconvenient spot on the railway, and on certain of their bridges. In the enlargement of Victoria Station, his Company had come across pipes of all kinds, and water-mains in particular; and it had cost many thousands of pounds to deal with them.

Answering Mr. FITZGERALD, in cross-examination, witness said he did not say that they would be prevented from widening their line; but by reason of the Board's works, if they did widen it, they would be put to very considerable extra expense. Under the Railway Clauses Act they had power to move and alter the position of any water pipe or main; but they had to pay the cost.

Mr. FITZGERALD pointed out that this discussion really arose on a new clause (55) which the Committee had accepted, and which simply put the Water Board in the position of every public authority throughout the kingdom who had the construction of either sewers or waterworks in their hands.

After further argument,

The CHAIRMAN (the Committee having consulted) said that at the beginning of the discussion he asked the question why everybody was not content with the general law as contained in section 308 of the Public Health Act. Everything that could be said in favour of the clause had since been said. The Committee were unanimous in saying that the Railway Companies had, in their opinion, all the protection they wanted under the general law.

The clause was therefore rejected.

A clause submitted by the Postmaster-General, applying the Telegraph Act of 1878, and giving wayleaves over the property of the Board, was next briefly discussed.

Mr. FREEMAN having read a letter from the Postmaster-General in support of his view,

The CHAIRMAN said: The Committee decide to insert the Postmaster-General's clause as submitted.

The following new clause, which Mr. Freeman said had been arranged, was then inserted:—

Notwithstanding anything contained in this or any other Act, the following provisions for the protection of the Mayor, Aldermen, and Commons of the City of London in Common Council assembled (in this section referred to as the "Corporation") shall, unless otherwise agreed between the Board and the Corporation, apply and have effect: Where in any street or place within the City of London the Corporation have constructed a subway or other work for the reception of pipes, wires, and other apparatus, such subway or other work shall, as regards all mains and pipes hereafter placed or renewed by the Board in any such street or place, be deemed to be a public service work within the meaning of part 5 of the "City of London (Various Powers) Act, 1900," and the provisions of that part of that Act shall, so far as applicable, extend and apply accordingly to such subway or other work, and to such mains and pipes belonging to the Board. Provided that whenever any main or pipe now in position shall cease to be used by the Board, such main or pipe shall, unless the Board think fit to remove the same, be sufficiently closed and stopped off to the reasonable satisfaction of the Corporation, and thereafter the Corporation shall hold harmless and indemnify the Board from and against all actions, claims, and demands, expenses or liability in respect thereof, and such mains or pipes shall be deemed to have been abandoned and become the property of the Corporation.

Agreed clauses for the protection of the Metropolitan Railway Company and for the Commissioners of Works having been inserted,

Mr. FREEMAN stated that the Treasury had submitted a clause for the protection of the Windsor Water-Works, the effect being to restrict the Board from sinking wells within a prescribed area; but he suggested that the Lord Chairman's clause, which had now been inserted in the Bill, and which was the general clause, covered the whole of it. It was therefore not necessary to have a separate clause for Windsor. The clause ran—

The Board shall not take any water or sink any wells in the valley of the Thames or the Colne, or their tributories, north of a line drawn east and west through the Royal Mausoleum at Windsor, except with the approval of the Commissioners of Works.

The Board could not agree to this. They had communicated with the Treasury to the effect that they could not accept the clause because it took in the whole of the watershed of the Thames and the Lea; and they had pointed out that they were now put under limitation by the Lord Chairman's clause as to sinking wells except upon the specific ground.

Mr. *W. B. Bryan* gave evidence to the effect that the Treasury clause, so far as the area on which they would draw water was concerned, would hamper the Water Board, not only as regarded their present powers, but for all future time. Since the clause was sent, the Lord Chairman's clause had been passed, limiting the taking of water; and, in his opinion, the latter clause covered the matter raised by the Treasury, and gave perfect protection.

The CHAIRMAN intimated that the Committee would not insert the clause.

The preamble of the Bill was then declared passed.

Price of Nitrate of Soda.—According to the half-yearly report of Mr. Thomson Aikman, jun., the world's consumption of nitrate of soda in the twelvemonth ended the 30th ult. amounted to 1,675,000 tons, compared with 1,610,000 tons in 1905-6—an increase of 65,000 tons; while the average price per hundredweight was 11s., against 10s. 9d. This figure is the highest for the past 24 years; the average price in 1882-3, when the consumption was 430,000 tons, having been 12s. 3d. The lowest since that date was 7s. 4½d. per cwt.—in 1897-8.

Electric Lighting at Brighton.—The electricity accounts of the Brighton Corporation show a loss on last year's working of £10,233; and the reserve fund has to be reduced one-half to meet this. The capital expenditure at the close of the financial year amounted to £758,279. The total revenue dropped from £86,076 a year ago to £81,415, though the number of customers had increased from 4387 to 4500. The gross profit was £33,971—a decrease of £3461; the percentage of gross profit to capital fell from 6·45 two years ago and 5·71 last year to 4·6, though there was a slight saving in the "works" costs.

Gas and Water Supply in the Rhymney Valley.—At the meeting of the Rhymney District Council last Wednesday, the Surveyor gave an account of the proceedings at the conference recently held at Caerphilly to consider the question of acquiring the gas and water works of the Rhymney and Aber Valleys Gas and Water Company, as reported in the "JOURNAL" for the 25th ult. (p. 1015); and it was decided that the Council should take no further part in the movement. A report was also given of the conference held at Newport to consider the Monmouthshire water scheme, to which reference was made in the same issue (p. 1021); and it was resolved that the same representatives should attend the next meeting and oppose the scheme.

Price of Gas at Malvern.—Owing to the rise in the price of coal, the tenders at Malvern represent an increase of nearly £1500, which has not been provided for in the estimated expenditure for the current year; and the Gas Committee recommended that the amount be dealt with at the close of the financial year. When the matter came before the Council, the Chairman of the Committee (Mr. Moerschell) urged that, as the profits from the gas-works went to relieve the rates, the non-consumers of gas should share in the extra expense owing to the increased price of coal. Mr. Sparkes said that if the matter be left till the end of the year they would have to pay the whole increase for this year of about £1600. Mr. Moerschell replied that £3112 had been handed over from the gas-works for the relief of the rates last year. Mr. Sparkes then moved an amendment that the price of gas be raised to 3s. 8d. per 1000 cubic feet. This, however, was lost, and the Committee's report was adopted.

Oldbury Gas Department.—At the monthly meeting of the Oldbury District Council last Friday, the accounts of the Gas Department for the year ending the 31st of March last, prepared by the Manager (Mr. A. Cooke), were presented. The principal items were given in the "JOURNAL" last week (p. 53). In moving the adoption of the accounts, the Chairman of the Gas Committee (Mr. J. W. Wilson, M.P.), remarked that they were very satisfactory; and, considering the position and size of the works, the amount of profit realized compared very favourably with neighbouring local authorities. He pointed out that in the near future it would be necessary to increase the storage for gas at the works. There was no other town in the Midlands with less gasholder capacity than Oldbury. He also alluded to the satisfactory increase in the sales of gas. A discussion ensued, in which it was urged that more of the profit from the gas undertaking should be applied in relief of the district rates; and Mr. Jackson intimated that he would move a resolution on the subject at a future meeting. The statement of accounts was then adopted.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, July 5.

(*Before Mr. Justice* SWINFEN EADY.)

Attorney-General v. Rhymney and Aber Valleys Gas and Water Company.

This was an action by the Attorney-General, on the information of the Caerphilly Urban District Council, and also by the Council; and the only issue of fact to be tried was whether the defendants had, in accordance with their statutory obligations, supplied pure and wholesome water to the Council's district, or whether they had been persistently supplying water of impure and unwholesome character, which was dangerous to health.

Mr. EVE, K.C., and Mr. ROWLANDS appeared for the plaintiffs; Mr. MACNAGHTEN, K.C., and Mr. AUSTEN-CARTMELL represented the defendants.

Mr. EVE, in opening the case, said the Company was incorporated by Act of Parliament in 1898, with the object of acquiring the works of a previously existing Company, and of giving statutory effect to certain agreements with several local authorities, among which the Caerphilly District Council were included. Having gone through the material clauses in the Act, which included power to construct reservoirs, Counsel said these powers had not been fully exercised, and the only important reservoir which had been constructed was at the north of the Council's district, at Ystradmynach. It held 42 million gallons. In October, 1902, an agreement was entered into under which the defendants acquired the water-works then belonging to the Council. These were very small, and their use had not been continued. [Counsel put in a plan, showing the district and the various reservoirs.] Speaking roughly, the population within the defendants' area of supply was 60,000 or 70,000, of which the Council's district accounted for about 30,000. It was rapidly increasing; something like 1000 houses per annum being built, which, of course, entailed an increasing demand for water.

Justice SWINFEN EADY asked if the complaint was as to the quantity or the quality of the water, or both.

Mr. EVE said the quality was the only question raised in the action. The real cause of contamination was at the very top of the area. It was said that this source of supply was not always resorted to; but there was evidence that it was used occasionally, and with the growth of the population it must be drawn upon more and more. The topmost reservoir originally belonged to the Rhymney Iron Company, and was fed by a stream called the Pittgwellt, which was a pure source. But in the immediate vicinity there was a farm which might cause pollution. The overflow went on to reservoir No. 2, holding 42 million gallons, which was also fed by the Pittgwellt and the Blaen Rhymney Brook; and there were serious contaminations to the supply between these two reservoirs. Counsel produced photographs showing these reservoirs, and also the various service reservoirs, or tanks, which helped to gather water on the way down to Caerphilly; and he said the great objection to them was that they were not fenced in or covered, and were open to various kinds of contamination. There having been a good deal of illness in the district, the Medical Officer's attention was called to the water; and in 1905 various samples were taken and examined by the County Analyst, whose analysis was so unsatisfactory that in February, 1906, other samples were taken and sent to Dr. William Smith, who made both chemical and bacteriological analyses of them. Counsel went on to state the results, which would, he said, be given in evidence. The effect of them was that nearly all the samples were condemned as unfit for domestic use. The relief asked was an injunction to restrain the defendants from permitting impure and unwholesome water to flow in their mains and pipes.

Justice SWINFEN EADY suggested that this was not a very convenient form of injunction, as the defendants might obey it by cutting off the supply altogether.

Mr. EVE said what the plaintiffs really wanted was to secure a proper supply of water, which it was believed could be done by providing filtration works and taking measures to prevent pollution.

Justice SWINFEN EADY asked if it was a question of allowing time to do the necessary works.

Mr. MACNAGHTEN said the defendants disputed the correctness of the analyses produced. They had offered to concur in appointing an expert to report and advise on the whole matter; but this had been refused by the Council.

Mr. EVE said he would now call evidence in support of his case.

Mr. *James Watson*, the Engineer to the Bradford Corporation, said he visited the *locus in quo* last June, and went over the whole district shown on the plan. He considered the defendants' storage capacity was inadequate for such a population. The gathering-ground on the Brecon Hills was excellent. The Rhymney Iron Company's reservoir held 5 million gallons, and there was no complaint to be made about it. There were no filtration works; but there were filter-beds lower down the valley, but not in working order. The second reservoir was fed in part by the overflow from the first and in part by the Blaen Rhymney stream. Between the first and second reservoirs there was a farm closely adjoining the stream, which he considered a very dangerous source of contamination. There was a manure pit very near the reservoir, and some of the cattle sheds actually drained into the stream. There were no sanitary conveniences that he could see about the farm, except one dry closet. There was another farm which drained into the stream, though it stood 200 or 300 feet from it. The reservoir was not fenced at all. Work was being carried on involving the presence of a number of men; but no conveniences were provided. He then came southwards, and inspected the service-tanks on the way to Caerphilly. There was one at Deri, which was properly fenced in. Farther south he came to Ystradmynach, where the pumping-station was. There were several cisterns there which were much coated with decayed vegetable matter. Farther on he came to Llanbradach, where there was another service reservoir, which was partly fed by a stream from the hills. By the side of it there was a considerable amount of *débris* which had evidently been taken from the tank. Witness went on to describe the other works on the way to Caerphilly, none of which furnished water which, in his opinion, was satisfactory for a domestic supply, except that at Cwm Ceffyl. These various service reservoirs were not sufficient for the supply of Caerphilly without aid from the large reservoirs. At Watford there was a good reservoir, which at the time of his visit was partially fenced in, and was fed from a distance. In his opinion, the small service reservoirs should be eliminated, and, if not, filtration works should be provided. He had seen the analyses of the water, and they were just what he should have expected from what he had witnessed.

Cross-examined: He considered a supply of 20 gallons per head per day very moderate. Nowadays this was a small supply for all purposes. The defendants' district was not a difficult one to supply, nor would it be very expensive. He was there two days. His principal complaints with regard to the second reservoir were the farm and the men at work close to it, with no conveniences. If the Company bought the farm, and prevented human habitation and the manuring of the land there, it would remove his principal objection.

Mr. *E. T. Morgan*, Inspector of Nuisances, proved the taking of samples of water in 1905 at the Watford reservoir, and in February, 1906, three samples from different houses in Caerphilly, Senghenydd, and Aber. The water came right off the mains; there being no cisterns. In September last year he took five other samples, which were all sent to London to the Institute of Public Analysts; and two other samples were afterwards taken. He had often noticed that the water was muddy and discoloured. There was typhoid fever in some of the houses where he took the samples. He spoke to seeing a dead dog and other objectionable matters in the reservoir.

Cross-examined: The water was put in sterilized bottles with glass stoppers sent from the Institute in a locked box. He let the water run for a quarter of an hour before taking the samples. About a month ago he saw sheep round the Watford reservoir, and manure on the fields surrounding the Senghenydd reservoir, which was supplied mainly from a spring. The surface water used to get in until lately; but it could not do so now.

Saturday, July 6.

Dr. *T. W. Thomas*, the Medical Officer of Health to the Caerphilly Urban District Council, said it was his duty to report on notifiable diseases occurring in the district; and he had included in his reports observations on the water supply. He was acquainted with the various tanks and reservoirs from which the district was supplied with water; and he agreed with the evidence given by Mr. Watson with regard to them. The unfenced condition of the Watford reservoir had been a matter of complaint for some time, and many outbreaks of diarrhœa and typhoid were due to the state of the water. In July, 1905, he reported to the Council that the samples taken were again unsatisfactory, as they showed evidence of contamination. Water from the Ystradmynach reservoir was unsuitable for domestic use; and he suggested that it should be boiled before being used. He produced the analyses received from the County Analyst, which, he said, confirmed his suspicion as to the unsatisfactory condition of the water; the number of organisms being too many to count. In February, 1906, he instructed the Inspector to take further samples, and to send them to Dr. Smith. He had examined water drawn from taps, and the appearance varied considerably. Sometimes it was pretty clear; but generally it was turbid and contained insects. The means of filtration were insufficient. He had seen surface water flowing into the Senghenydd reservoir as lately as the 10th of April last, and should say the adjacent gathering-grounds were unsuitable, as they consisted of manured fields. To put an end to contamination, the farmhouses should be done away with, proper supervision exercised over the intake, and efficient filtration provided.

Cross-examined: No complaint had been made by the Council with regard to the Blaen Rhymney supply before the commencement of the action. He did not know that the defendants took over the supply to Caerphilly about February, 1893, or that before then the Council supplied water from Nant-y-Galch. He had reported unfavourably about the quality of this water; and he believed the supply had now been discontinued. In 1904, the Council wrote to the Water Company stating that they were going to apply to the Attorney-General to institute proceedings. A number of analyses of the water were made at Cardiff, and the report was that it was a moderately pure water. No proceedings were taken. On July 24, 1905, he reported that further samples of water had been analyzed, and that they showed no signs of contamination by sewage or animal or vegetable matter. His principal objection was to the unfenced condition of the Watford reservoir. After his report, there were several cases of typhoid fever; but he did not attribute them to the water, as, in his opinion, they were due to defective sewerage. Water would not give persons typhoid fever unless there were typhoid germs in the supply.

Mr. *Joseph Howell*, a member of the Caerphilly Council, produced samples of the Company's water taken in his house in January last—some from the scullery tap and others from the bath tap, which was supplied direct from the main. All were very dirty, and no one, he said, would think of drinking the water. In April, accompanied by two members of the Council, he visited the reservoirs; and from what he saw, he was able to confirm the evidence given by Mr. Watson.

Cross-examined: The samples he produced had not been analyzed. He admitted that in January last the Company wrote to the Council suggesting that an independent analyst should be appointed to examine the water; and if anything needed remedying they said they would do it. This offer was not accepted, though personally he was in favour of it being done.

Mr. *H. A. Scholberg*, of the Cardiff and County Public Health Laboratory (who attended under subpœna), said he had had submitted to him from time to time various samples of water which he had

examined bacteriologically. In one sample, taken from the Watford reservoir, the organisms developing at 37° C. were too many to count; the number developing at 20° C. was 126; and *bacillus coli* developed at 0·1°C. The water was most unsatisfactory—there being strong evidence of contamination. Other analyses showed similar results.

Cross-examined: It was undesirable that *bacillus coli* should be present in water, though many drinking waters contained it. He should not condemn the water on this account alone, seeing that the percentage was very small. He did not attach much importance to the number of organisms, unless they were excessive; the number depended a great deal upon where the water came from. If going any distance, samples should be packed in ice.

Re-examined: The statement in a text-book, that "the presence of the *bacillus coli* in drinking water should always be regarded with grave suspicion," was too sweeping. No doubt its presence was due to contamination by sewage; and the water containing it could not be considered pure.

The hearing was continued yesterday, when evidence was given by Dr. W. R. Smith, F.R.S., the Principal of the Royal Institute of Public Health, and the plaintiffs' case closed. Mr. Macnaghten then opened the case for the defendants, and contended that the water supplied by them was pure and wholesome within the meaning of the Act. He called in support of his contention Mr. E. K. Burstal (of Messrs. Stevenson and Burstal), Sir William Crookes, F.R.S., and Mr. Henry Crookes, F.C.S., and the Court adjourned till this morning.

THE PRICE OF GAS IN MESSINA.

The Dispute between the Municipality and the Continental Union Gas Company, Limited.

The claim of the Municipality of Messina (Sicily) to share in the economies effected in the manufacture of gas by the Continental Union Gas Company, Limited, who hold the concession for lighting the town, was referred to in a communicated article in the "JOURNAL" for Aug. 21, 1906 (p. 517). From our contemporary, "Il Gaz," we now learn that the dispute has been settled, and that the *Collegio Arbitrale* have given their award. They declare that the Commune of Messina, by virtue of article 7 of the agreement of Sept. 16, 1861, have the right to a half share in the economies obtained by the Gas Company in public and private lighting which are due to scientific progress and the adoption of modern methods of coal-gas manufacture. Such methods are stated to be: (1) The introduction of exhausters, (2) new processes of purification, and (3) regenerative furnaces. They declare that the right of the Commune to profit by the economies due to these three means commences from Jan. 29, 1906, which is the date when these proceedings were commenced, and that their right continues during the whole subsequent period of the concession. The economies which have accrued under these three headings are estimated as being 0·96, 0·19, and 0·85 of a centime—that is, in all, 2 c. per cubic metre of gas sold to the consumer (equivalent to 5½d. per 1000 cubic feet of gas). The price of gas, both for public lighting and for private purposes, ought therefore at once to be reduced to one-half of this saving, or by 1 c. per cubic metre. The Company are ordered to pay to the Commune the sum of 12,648·65 lire (about £506), with the legal interest upon it from the date of judgment to that of payment. Other demands of the Commune are rejected. The taxed costs of the proceedings are fixed at 1312·45 lire (£52), of which the Company have to pay one-third; while the costs of the three Arbitrators amount to 18,000 lire (£720), of which each party must pay half.

Claim for Reinstatement Expenses.

In the Westminster County Court on Friday, his Honour Judge Woodfall gave judgment in the case of the *Metropolitan Water Board v. Wheeler and Son*, which was an action to recover £21 for reinstating ground opened for the purpose of repairing a burst pipe at the defendants' premises in New King's Road. The defendants undertook to pay the cost of opening and reinstating the ground—an area 4 feet by 2 feet. The plaintiffs opened the ground and filled it in; but the Fulham Borough Council completed the job, and found, owing to percolation, that it was necessary to reinstate an area 30 feet by 12 feet, and the account for the work amounted to £21. This sum the plaintiffs paid, and sought to recover it from the defendants. The defence was that the undertaking was to pay for the reinstatement of the area opened by the plaintiffs; and it was contended they were not liable for the extra area the Borough Council chose to reinstate. His Honour said no intimation was given to the defendants that the area was to be extended. He found the whole of the work done was necessary and the charge reasonable; but he was of opinion that the defendants' liability only extended to the outlay necessary to repair the pipe, and for this they had paid £3. The parties were both mistaken as to the extent of ground it would be necessary to reinstate—neither of them contemplating the amount of damage to the highway. He gave judgment for the defendants, with costs; but said if the plaintiffs desired to appeal he would give leave on their undertaking to pay the costs in any event.

Gas v. Electricity for Workhouses.—The Brentford Guardians had before them at their last meeting offers from the Heston and Isleworth District Council to supply electricity, and from the Brentford Gas Company to supply gas, to the workhouse buildings. The Council quoted 3d. per unit for five years, with a minimum consumption of 50,000 units. The Gas Company's quotation was 2s. 5d. per 1000 cubic feet for the whole of the buildings. In support of the installation of electricity, it was urged that the new buildings had been wired; and it was also contended that the municipal enterprise should be supported. The advocates of gas pointed out its cheapness and the absence of troublesome conditions in the Company's offer. In the result, it was decided by a large majority to accept the Company's quotation.

MISCELLANEOUS NEWS.

MUNICIPAL TRADING CONSIDERATIONS.

Meeting of the Industrial Freedom League.

In the course of the proceedings at the Fifth Annual Meeting of the Industrial Freedom League, which was held in London last Thursday, considerable reference was made to gas, electricity, and water questions, as will be seen by the following notes from the speeches. The gathering was not a very large one; but what it lacked in numbers it made up for in enthusiasm. The chair was occupied by Sir FELIX SCHUSTER, Bart., who is well known in City financial circles as the Governor of the Union of London and Smith's Bank, Limited.

The CHAIRMAN, in the course of his speech when moving the adoption of the report and statement of accounts, said that the former testified to the useful work carried on by the League, under circumstances of considerable importance to the community at large. His task was made easier, and at the same time more difficult, because they would have the privilege of hearing the resolution seconded by the one man who had made the subject peculiarly his own, and could speak on it with far greater authority than he (the Chairman) could. He referred, of course, to Lord Avebury; and even his Lordship might find some difficulty in adding to the arguments he had so ably adduced, and supported by such valuable evidence, in that remarkable book of his on "Municipal and National Trading,"* a work in which it would appear that the last word had been said, and which seemed unanswerable. He was sure they would not think it out of place if, in the name of the members of the League, he tendered to Lord Avebury their warmest thanks for the great service he had rendered to the community by the issue of this work, at a time when the enlightenment of the public was greatly needed.

INDIVIDUAL EFFORT OR MUNICIPAL MONOPOLY.

The League was not a political organization, and included members of all parties; but during the recent elections they called upon the voters to give their support only to those candidates who were in favour of the principle of individual effort and enterprise, as opposed to municipal trading and monopoly. He thought they might claim that the people of London had now given these principles their emphatic approval. Monopoly was injurious to the community under any circumstances. A State or municipal monopoly was, however, worse than any other, on account of the absence of that control by the public authority to which all other monopolies, should they exist, must be subject. Far be it from him to assert that there were not many undertakings of public utility which by their nature could only be carried out by public authorities, and for which private enterprise was not so well adapted. It was in order not to hamper authorities in carrying out such work, and to keep their credit unimpaired, that they wished to free them from the risks of trading in matters which required the experience, energy, and effort of the individual, and to which no large body of men, however able, could possibly attend with the same efficiency. It might be asserted that, as regarded the development of trade generally, one of the most remarkable features of the Nineteenth Century had been the growth of joint-stock enterprise; that joint-stock companies had successfully competed with private traders; and that elected bodies corresponded to boards of directors in a joint-stock company carrying on large undertakings. But let it be always remembered that such directors were much fewer in number; that they were not elected by popular vote, but chosen for special experience in a particular line; and that even among joint-stock companies only those had been found to be really progressive and prosperous in which individual effort and sense of responsibility had found full scope.

THE CASE OF LONDON.

The evidence of Sir Melvill Beachcroft, the Chairman of the Metropolitan Water Board, in this respect was so valuable that it deserved to be put on record. In his review of the work performed by the Board during his four years of office, he said: "So far it must be admitted that no saving had been effected. He did not think it was ever anticipated that there would be any saving in the expenses of administration, as the management of a trading concern by a municipal body must always involve expenditure quite outside that which fell on the private company." He added that the advantages must be sought in another direction; and he also stated that the official staff numbered 732, as compared with 599 when the undertakings were handed over, and the employees 3153, as against 2907 at the time of transfer. In connection with this statement, it would be remembered that in 1902 the Special Arbitration Committee of the Board reported that an approximate annual saving of close upon £95,000 was to be anticipated, that additional profits in the future were to be expected, and that further substantial economies also might be looked for. The ratepayers were certainly not led to expect an increase in the charge for water, which in some instances had already taken place, and which, if the Bill now before Parliament became law, would impose (under the guise of equalization of rates) heavy additional burdens on certain classes of the community. The ratepayers of London, and especially the traders of the City, should see to it before it was too late that the Bill did not pass in its present state, else serious loss would accrue. So much for the financial aspect of this latest substitution of municipal for private enterprise; and they would all agree with Lord Avebury that the supply of water was perhaps the strongest case that could be made out for municipal enterprise. Whether any advantage would be derived from a more generous supply and more careful safeguards as to purity, remained to be seen. As regarded electric power, they all knew how far ambitious schemes had hindered the development of private enterprise, thus preventing the public from obtaining the supply which, without risk to the ratepayers, private undertakings could no doubt

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* See "JOURNAL," Vol. XCVII., p. 22.

have provided. Here, again, the best and most economical solution of a difficult problem would appear to be the open competition of private enterprise, subject always to public control. It should be borne in mind that, as pointed out in the report of the Royal Commission on London Traffic, in other countries it was not unusual for municipalities to construct, purchase, or otherwise acquire undertakings of public utility, while leaving the actual working to companies, with provision for proper rates and general control; and that it was claimed that such methods yielded better financial results, and avoided difficulties that might arise from municipal authorities carrying on business on a large scale.

EFFECT OF EXCESSIVE BORROWING.

He had already referred to the necessity of keeping the credit of municipalities unimpaired, in order to enable them to carry out the many duties encumbent upon them. That this credit did not stand so high as they would like to see it, there was no doubt. Capital was easily alarmed; and credit once lost was not readily regained. It was quite true that many causes had contributed to the depreciation in the market for so-called gilt-edged securities; but there could be no doubt that excessive borrowing by municipalities was largely responsible for the prevailing depression. The one remedy seemed to be strict regard for sound financial principles. In Germany, the country of "lavish municipal expenditure," according to the Lord Mayor, the laws which regulated municipal borrowing were very strict. But even there reports stated that municipal borrowing had been considered excessive; that money for municipal loans was to be obtained only with great difficulty; and that not only municipal credit, but also National credit, had suffered accordingly. In the United States the same symptoms were to be observed; and the City of New York, which not many years ago was able to obtain loans on a 2½ per cent. basis, had had to increase the rate to 3½ per cent., and the previous week could not successfully float an issue on a 4 per cent. basis. It was the same here. Ten years ago, the London County Council issued 2½ per cent. stock at an average price of £100 9s. 8d.; but this stock was now quoted at about £72, and the latest issue was a 3½ per cent. stock at £97. As he had said, other causes had contributed to this depreciation; but the very high municipal borrowings were to a large extent responsible for it.

THE AUDITING OF ACCOUNTS.

A resolution was to be moved with regard to the auditing of accounts of municipal authorities; and he need not enlarge upon it, except to say that it would have his warmest support. They were all glad to see that the London County Council had now accepted the principle which the League had advocated so long; and they would look forward with great interest to the report which the independent Auditors were going to prepare with regard to the various enterprises the Council had embarked upon. It was to be sincerely hoped that the example thus set by the foremost Municipality in the kingdom would soon be followed by others. Among the matters that should be fought against was the deprivation of joint-stock companies of the right to vote; and there remained in other directions plenty of work for the League, which existed, not in the interests of one section, but in those of the community at large—and especially in the interests of the working classes, whose welfare, and whose very livelihood indeed, they believed, were absolutely dependent upon the continued unfettered progress of that private enterprise and individual freedom to which the commercial prosperity of this country was so pre-eminently due.

MUNICIPAL ELECTRICAL UNDERTAKINGS.

Lord AVEBURY, who seconded the motion, remarked that he was surprisd to see that in a speech a few days previous the President of the Board of Trade had stated that the gross profit made by provincial municipal electrical concerns was £2,000,000; and he characterized this as a great triumph for municipal enterprise. The gross profit, however, of an undertaking really indicated nothing. What one wanted to know was the net profit; and if the President of the Board of Trade had gone further, and looked at the net result, he would not have had much reason to congratulate himself or the unfortunate ratepayers. The total amount invested in these undertakings was shown in the "Electrical Times" to be £34,884,000; and as the rate of interest paid by municipalities was now about 3½ per cent., and in many cases more, this would represent just over £1,000,000. Then there came the question of what ought to be allowed for depreciation. Much of the machinery employed was of a character which did not last very long; and moreover such improvements were continually being made that very often machinery which would go on working would still be better consigned to the scrap-heap, because it could be replaced by other more suitable for its task. Those who had had experience would be generally agreed that to take 3½ per cent. for depreciation would be very moderate. This would come to another £1,000,000, which made £2,000,000 altogether to be deducted from the gross profit, and left nothing as the result of the working of these great undertakings. But this was not quite all, because they now knew that a very inadequate amount had been allocated, as regarded tramways and other similar undertakings of the London County Council, for rent, central staff, law expenses, &c.; and if fair charges had been made in these items, he ventured to assert it would have thrown the balance considerably on the wrong side.

THE COST OF STREET LIGHTING.

Then there was another matter. He regretted to say that it was very much the custom, in connection with these municipal enterprises, to charge an undue amount for street lighting. If they took London, the heaviest sums charged for street lighting carried out by municipalities—without mentioning names—were £259, £204, £198, and £194 per mile. The highest charges made in the localities where the municipalities wisely availed themselves of private enterprise were £176, £120, £100, and £91 per mile. The lowest figure was £156 for municipalities; whereas the two lowest amounts charged by gas companies were £74 and £72. Therefore the lowest of the municipalities was, with one single exception, higher than the highest of the cases where private enterprise was doing the work. It was perfectly clear that a very undue amount had been charged for public lighting, which went to make the profits of the electric installations look larger than they were.

THE LONDON WATER PURCHASE.

He had always endeavoured to persuade his fellow citizens in London that they would gain nothing by buying up the Water Companies; and he thought most of them now agreed with that. The water was the same; and there was no more of it. The question of purity was important; and there was greater security in this respect when they had the Water Companies watched vigilantly—he might say jealously, but not too jealously—by the London County Council than now, when there was practically nobody to look after the supply more than there was before, and, in fact, somewhat less. He was not saying this to criticize the Water Board. They had a most excellent Chairman in Sir Melvill Beachcroft. He had done everything man could do; but he (the speaker) did not believe any Municipal Water Board could manage an undertaking so well as it was managed before, and he was afraid they would all have to pay heavily for the change which he ventured to think was so unwisely made.

THE POLICY OF THE LEAGUE.

In the last few days, they had seen another development, in the throwing out of the Electrical Bill of the present County Council. This meant that people would have to pay higher rates than they need for an electricity supply, because the present House of Commons would not, if they could help it, allow anything to be done by private enterprise. The main reasons which seemed to him to justify the policy of the League were: (1) That local expenditure was increasing more rapidly than rateable property. (2) That local indebtedness was increasing more rapidly than rateable property. (3) That municipal trading could not fail to give rise to awkward labour problems. (4) That municipal trading had seriously interfered with private enterprise and with foreign commerce. (5) That it was unwise to give votes to those who paid no rates, and unjust to withhold them from those who did. (6) That by reducing the demand for labour, while increasing prices and raising rates, municipal trading had not only injured ratepayers generally, but especially the working classes, and that carried to its logical conclusion it would involve the loss of their freedom.

The resolution having been carried unanimously,

Colonel Sir JOHN E. BINGHAM, Bart., proposed the re-election of the officers; and, in doing so, he remarked that the low price of gas in many places kept down the price of electricity, which was greatly to the advantage of the ratepayers.

PRICE OF GAS IN YORKSHIRE—THE SHEFFIELD UNDERTAKING.

With reference to the prices charged by 39 authorities in Yorkshire who owned their gas-works, he saw there were 14 of them charging 3s. to 3s. 9d. per 1000 cubic feet; 19 from 2s. 6d. to 2s. 11d.; 6 from 2s. 1d. to 2s. 5d.; and none under 2s. 1d. The average of the lot was 2s. 10d. per 1000 cubic feet—a good deal more than double the price of Sheffield gas. But as touching municipal speculation. They were met in Sheffield by a proposition to buy up the gas-works, which had done so well for the city. He had nothing against the gentleman who proposed it; but, to his mind, it could be for no other reason than to endeavour to make the electric lighting pay by increasing the cost of gas and appearing to make money for the city, and then by increasing the price of electric light. He could promise Sheffield that the price of gas, without any profit to the city, would come out at a higher figure than at present. The existing low price was a very great gain, more especially to the working classes.

A RESOLUTION ON AUDITING.

Mr. Deputy GEORGE EDWARDS proposed—"That this meeting regrets that steps have not been taken to put in force the recommendations of the Joint Select Committee of the House of Lords and the House of Commons on Municipal Trading, in regard to the audit of the accounts of local authorities, and that, though the audit of the Local Government Board was unanimously condemned by the Joint Committee, the scope of its operations is being constantly extended; and that a copy of this resolution be sent to the Prime Minister, the President of the Local Government Board, and the President of the Board of Trade." He remarked that if a reliable audit was necessary for a public company which the shareholders had only entered voluntarily, it was much more necessary for a municipality where the people had to subscribe by a levy of rates whether they wished to do so or not. If an undertaking was carried on in a skilful manner, there should be no fear—in fact, an independent auditor's report should be welcomed by all. No auditor could direct the policy or management, nor prevent the making of bad bargains; but he could place such information and figures before the public as might save them from living in a "fool's paradise." It was not a question of party politics, as both sides were agreed on the principle; and therefore they could with confidence ask the Government to take steps as speedily as possible to carry into effect the recommendation made by the Joint Committee four years ago.

Mr. J. M. FELLS, in seconding the resolution (which was agreed to), pointed out that many municipalities were in favour of such an audit as was hinted at.

A LONDON TRAFFIC BOARD.

The final business resolution passed was as follows: "That in the opinion of this meeting, the creation of a Traffic Board in relation to locomotion and transport over the area of 'Greater London,' as recommended by the Royal Commission on London Traffic, is of the utmost importance; and that His Majesty's Government should be urged to bring in a Bill to give effect thereto without delay; and that a copy of this resolution be sent to the Prime Minister and the President of the Board of Trade."

The CHAIRMAN, in acknowledging a vote of thanks, laid stress upon the fact that in his earlier remarks he had not meant in any way to criticize Sir Melvill Beachcroft, who was put into a position which he had admitted was a most difficult one. He had carried on the work admirably, and so had the whole of the Board; but what the League maintained was that even the best of men could not make the Board that success which was expected.

POULTON-LE-FYLDE GAS ARBITRATION.

The Value of Part of an Undertaking.

At the Surveyors Institution, Westminster, on the 28th and 29th ult., and the 1st and 2nd inst., Mr. H. GRAHAM HARRIS, M.Inst.C.E., presided, as sole Umpire, to assess the compensation to be paid the Poulton-le-Fylde (Lancs.) Urban District Council, who are the proprietors of the gas-works in the district, for the portion of their undertaking which is in the area of the Thornton Urban District Council, which the latter Council are taking over.

Mr. E. F. VESEY KNOX, K.C., and Mr. T. E. MANSFIELD appeared for the Poulton-le-Fylde Council; and Mr. SUTTON, K.C., and Mr. C. C. HUTCHINSON represented the Thornton Council.

Mr. VESEY KNOX, in opening, said the gas was originally supplied to the district by a Mr. Parkinson, who started the works in 1885; and in 1888 a private Company was formed to run the undertaking. Under the statutory Order forming the Company, it was provided that if within fourteen years Poulton was formed into a local urban authority, that authority should have power to purchase the gas undertaking at the expiration of seven or within fourteen years. In 1900, the township became a Local Authority; and in 1901 they obtained an Act authorizing them to take over the gas-works. This they did under arbitration, at which Mr. Ernest Moon, K.C., acted as Umpire; Mr. Thomas Newbigging being Arbitrator for the Company, and Mr. Valon for Poulton. The sum awarded was £18,133, including some portion of the costs. A part of the area of supply was in the district of Thornton; and when Poulton obtained their Act, a clause was inserted which provided that if any local authority part of whose district was within the area of supply at any time gave notice of their desire to purchase such portion of the Poulton undertaking, that authority should not oppose. The Thornton district in 1900 became an Urban Authority. In 1903 they gave notice to Poulton of their desire to buy out the part of their gas undertaking within the Thornton boundaries, and in 1905 gave the necessary statutory notice to purchase. As an agreement could not be arrived at, this arbitration resulted. Counsel pointed out that the maximum price allowed to be charged by Poulton was 7s. 6d. per 1000 cubic feet, and the candle power 12. The price charged, however, had not been more than 3s. 9d. For the purposes of the award, it had been agreed that the capital of the undertaking with the addition of the sum of £3644, the cost of the arbitration, should be taken at £23,775. In Thornton the area of supply was 1158 acres, out of 3539 acres—the area of Thornton. In 1896, the sale of gas was 2,977,000 cubic feet; in 1901 it had gone up to 7,000,000 feet; in 1905-6 it had increased to 10,307,000 feet; and in 1906-7 the sales were 11,005,000 feet. There was a gross increase of 50 per cent. in four years. The gross rental from Poulton was £2092 15s. 3d., and from Thornton £235 3s. 7d. In Poulton, 80 per cent. of the population were consumers; and it was claimed that within a short period it would be the same in Thornton. Taking this as the basis of the calculation, and the profit in the district at 28 years' purchase, it was claimed that the value of the Thornton area was £15,400. But to obtain this a further expenditure of capital, at the rate of £850 per extra million cubic feet supplied, would have to be incurred on a total of 6,000,600 feet. This would reduce the sum by £4188; making the amount of the claim £11,212. This they suggested should be deferred for a period of three years, by which time they calculated they would have secured the same percentage of consumers as Poulton. To the total again would have to be added a proportion of the £3000 incurred by Poulton in fighting the Gas Company.

Mr. *J. B. Moss*, the Surveyor to the Urban District Council of Poulton, proved the various plans and maps put in, and Mr. *Drummond*, a Surveyor and Architect of Fleetwood, gave evidence to the effect that various building estates were being laid out in the Thornton district which would increase the number of consumers.

Mr. *J. L. Walker*, the Gas Manager at Poulton, described the works in detail, and said they were of sufficient size to meet the growing requirements of the whole district. If Thornton were taken away, the use of a large part of the works would not be required for many years to come. There was a gasholder capable of holding 18,000 cubic feet; another prepared for telescoping, which would hold 26,000 feet, and with little cost could be made to hold 30,000 feet. Their present capacity was 44,000 feet; and with a little expenditure the storage could be increased by another 30,000 feet.

Mr. *E. W. Drew* (of Messrs. Wood, Drew, and Co.) said the purchase price of the undertaking from the Company was £18,331, and £1800 for repayment of loan capital. Subsequent to the transfer to the Council there were other payments for the cost of the arbitration, compensation to Secretary, &c., bringing the total spent in acquiring the undertaking by the Poulton Council up to £23,925 1s. 7d. After the works were taken over, the Council expended a further sum on plant, mains, fittings, &c., bringing the capital expenditure up to £26,404 18s. 10d. The profits shown on gas were £944 18s. 1d. in 1904, £956 1s. 6d. in 1905, and £1110 1s. 8d. in 1906. This was not a profit in the relief of rates, because there was interest and sinking fund to be paid, and there were deficiencies in the corresponding years of £615, £603, and £774; but it was profits he would have counted as profits had he been making out the accounts of a gas company.

Mr. *H. E. Jones*, dealing with the valuation of the part of the undertaking in Thornton, said Mr. Drew brought out in round figures the profit at 2s. 2d. per 1000 cubic feet of gas. Taking the population of Poulton and Thornton at 4425 in 1906, he found that they consumed 10,307,000 cubic feet of gas. In 1907, the sale of gas was considerably larger, and had gone up 5 per cent. in one year in Thornton. In Poulton there were 406 consumers, who consumed 9,485,000 cubic feet; and he allocated to them a profit of £1027. On this basis, the estimated population of Thornton (1925) would consume 6,600,000 cubic feet. Taking the same basis of profit as now made, this would amount to £720. But it would take some year or two to gather the full crop of consumers; and he would reduce the figure of profit to 1s. 8d. per 1000 feet. This would bring down the figure of profit to £550. This, on a 28 years' purchase, gave a total of £15,400. To obtain this profit, additional works, capital, fitting, &c., would be required to the extent of £4188 net—bringing the £15,400 down to £11,212. But Thornton should contribute toward the expenses incurred in getting the undertaking from the Company; and he said they should pay £1650 for this—making the total claim £12,862. Taking off the amount allowed for having deferred the compensation for three years, his total worked out at £11,575.

Mr. *W. Newbigging*, in giving evidence, said he considered Thornton would be a better consuming district than Poulton when it was fully developed. In order to supply the increased demand, he placed the additional expenditure at £700 per million cubic feet on 5,770,000 feet. He thought the calculation that 80 per cent. of the residents in Thornton would use gas a reasonable one, and also that this 80 per cent. would be obtained in three years. His valuation was £11,288 4s. 10d.

Mr. *Robert Porter*, the Engineer and Manager of the Elland Gas Company, considered the existing works at Poulton were sufficient to allow for considerable extension of business. The plant was all in advance of requirements for some years to come, and the taking of Thornton would adversely affect the plant so far as its earning capacity was concerned.

This concluded the claimants' case.

Mr. SUTTON did not address the Umpire for the Thornton Council, but proceeded to call witnesses.

Mr. *Arthur Hindle* said he had assisted the Thornton Council in respect of the existing gas undertaking. The Cleveleys part of Thornton would be the first to develop—this being a large area on the Blackpool side; but the area now under discussion would be slow in developing. He estimated the expenditure of the Poulton Council to get through to the Thornton area at £1425. Deducting certain expenditure for works not attributable to the area itself, he said that the net amount should be £981.

Mr. *E. H. Stevenson*, who was engaged in the arbitration between the Gas Company and the Poulton Council when the latter took over the works, said there was no material alteration in the works since then, with the exception of certain new works spoken of, which were really replacements. He placed the consumption in the Thornton area in 1907 at 1,234,000 cubic feet, and the whole area at 11 million feet. The income from 1¼ million feet of gas (the consumption in Poulton) was what they had to purchase that day. He contended that the works to-day were bearing all they possibly could. There was absolutely no stand-by. The maximum make and maximum sale were practically the same; and the taking away of Thornton would be a benefit to them. The value of the works in Thornton he placed at £981. Having regard to all the circumstances, he fixed the net profit per 1000 cubic feet at 19·03d. instead of 25·85d. shown by the Poulton authority. In ascertaining the proportion of permanent works due to Thornton, he had taken 11 per cent. of the total sales. He found the total value of the existing works to be £6875. The proportion of gas sold in Poulton to that in Thornton was as 88 to 11; and he had taken 11 per cent. of the works value. This would give £770. He took a return of 4 per cent., and estimated the profit in Thornton at £82 for normal supply and £16 for the remainder. This he capitalized on the basis of 22·22 years' purchase; and having made allowances for any sterilization that might ensue through separation (to the extent of one year), he got the commercial value of the Thornton part of the undertaking, which was £1208. There should be no allowance for compulsory purchase, as the Poulton Act provided that the undertaking might be taken over at any time.

Mr. *J. Wilkinson*, the Engineer and Manager to the Halifax Corporation Gas-Works, gave evidence to the effect that he calculated the profit per 1000 cubic feet at 18·92d. The total profit derived from Thornton he estimated at £97 5s. 7d. per annum. This he dealt with upon the basis of 22·22 years' purchase. After making allowances for certain items of expenditure which would be incurred, his net valuation was £1238 16s.

Mr. *Isaac Carr* produced similar figures to the previous witness.

Mr. *F. H. Gorst* gave evidence to the effect that the growth of Thornton would be slow, owing to a portion being liable to flooding.

Mr. SUTTON, in the course of reviewing the evidence, contended that a greatly exaggerated view had been taken by the claimants as to the value of the part of their undertaking under discussion. They were not entitled to goodwill under their Act, and could not claim 10 per cent. for compulsory purchase.

This concluded the proceedings; the Umpire intimating that he reserved his award.

COMPANIES AND LOCAL AUTHORITIES AS TRADERS.

The time of the members of the Aldershot District Council was needlessly occupied at the last meeting in listening to the Chairman (Mr. C. A. L. Calvert) inveighing against the Aldershot Gas and Water Company for having exercised their perfectly legitimate rights. Certain water consumers, owing to financial difficulties, had been unable to pay their accounts, and consequently their supply had been cut off. This was characterized by the Chairman as "a most arbitrary action." He said the Council were trying to raise the health of the town, and they had a Company who could render all their efforts void by cutting off a water supply without notice. How was it possible, he asked, for the Council to improve the health of the town while such a thing existed? He proposed that a Committee should be formed to go into the matter; and, if necessary, he would be prepared to ask Parliament to alter the "drastic powers" the Company possessed. A man could not live without water—it was a necessity; and he considered the Company ought to give at least three months' notice of their intention to cut off the supply. In the midst of what a member characterized as the "rather destructive suggestions" that were being made, Mr. Bateman put a very sensible question as to whether the Company had exceeded their powers; and the Chairman acknowledged that they had not. The Rev. de Verd Leigh asked the Chairman if it would meet his wish if he proposed that a letter should be written to the Company

asking them if they could give at least three months' notice in case of cutting off water under circumstances similar to those in the cases in question. Mr. Robertson pointed out that this was entirely against the law—"a law they made to suit themselves," was the Chairman's comment. But it met with a negative reply from Mr. Robertson. The Rev. de Verd Leigh suggested that, as the Company had said they were willing to consider anything that would be for the good of the town, it would be wise for the Council to approach them in a friendly spirit, and ask them to deal leniently with cases such as those which had been referred to. Mr. May said if they acted on this suggestion, people would be asking them what they did when a man did not pay his electric lighting rate. "Have we summoned a man when he has not paid his electric light rate?" asked the Chairman. "Yes," replied Mr. May; "and stopped his supply." The answer was received with laughter. Eventually the Council decided to write to the Company.

DARLINGTON CORPORATION GAS SUPPLY.

The Past Year's Working.

We have received from the Gas Engineer and Manager of the Darlington Corporation (Mr. Frank P. Tarratt) the accounts and statistics of the gas undertaking for the year ended the 31st of March, as prepared by Mr. J. W. Armitage, the Borough Accountant. The sale of 324,783,812 cubic feet of gas for public and private lighting produced a revenue of £33,970; meter and stove rents came to £1735; residuals realized £12,422; and the profit of the fittings department for the year was £133—the total receipts being £48,751. The expenditure on material and handling of same for the manufacture of gas was £18,116 (coal costing £17,657); stokers' wages came to £4201; repairs of works and plant to £5248; distribution cost £2234; rents, rates, and taxes amounted to £2288; management to £1288, and other expenses made a total of £35,271—leaving a balance of £13,480. This sum, added to the amount brought forward, made £18,719, of which £4042 was transferred to the liquidation of loans account, £3113 was paid for interest, £4000 was transferred to the district fund in aid of the rates, £1239 was placed to reserve account, and £6325 was carried to the balance-sheet. The capital invested in the undertaking on the 31st of March last was £185,013, being equal to 11s. 5d. per 1000 cubic feet of gas sold, and the gross profit was equal to 7·287 per cent., and the net profit to 3·419 per cent. upon it. The quantity of coal carbonized was 36,124 tons; and the gas made was 350,743,000 cubic feet, of which 330,434,812 cubic feet were accounted for, or 92·33 per cent. of the make. The revenue from gas was equal to 2s. 1·102d. per 1000 cubic feet sold; but as the net cost was 1s. 3·141d., the gross profit was 9·961d. The net price charged to ordinary consumers is 2s., to large consumers 1s. 10d., and to those on the prepayment system 3s. 1d. per 1000 cubic feet. For power purposes, the price is 1s. 6d.

LONGTON CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The accounts of the Gas Department of the Longton Corporation for the year ending the 31st of March have been issued. They are signed by the Engineer and Manager (Mr. W. Langford), who has also charge of the electricity undertaking of the Corporation. The report of the Committee (of which Alderman Brookfield is Chairman) sets forth that the total quantity of gas made in the year was 151,076,000 cubic feet; being an increase of 5,484,000 cubic feet, or 3·76 per cent. The gas sold showed an increase of 5,591,000 cubic feet; while the gas unaccounted for equalled 6·24 per cent., which for a mining district was satisfactory. Twelve months ago, the price of gas for motive power was substantially reduced; and the Committee are pleased to report an increase in the sale for this purpose of 1,502,000 cubic feet. The total number of gas-engines in use is 69. The following figures show the consumption: Gas sold for motive power, 11,462,200 cubic feet; for lighting and heating (ordinary meters), 64,051,000 cubic feet; for lighting and heating (slot meters), 44,365,800 cubic feet; for public lighting, 20,070,000 cubic feet. The works and plant were well maintained; and no additions were made to the capital account. The Committee say the general working results were very satisfactory; the make of gas per ton of coal and per retort being the highest recorded. The profit on the year's working amounts to £10,321, against £9662. This profit has been carried to the net revenue account; and after deducting interest and sinking fund charges (amounting to £6058), and paying over £2500 to the borough fund in relief of rates, together with £501 placed to the reserve and depreciation fund, there remains a further balance of £1262. From this, the Committee recommend that the loss of £201 on the Electricity Department for the year should be made good, and that the balance of £1061 should be dealt with as follows: £531 to go to the debit balance on the Gas Department, and £530 to the debit balance on the Electricity Department. This disposes of the whole of the gas profits, and leaves a debit balance on the Gas Department of £874. Since 1878, when the gas-works were acquired by the Corporation, £62,897 has been paid into the borough fund in relief of the rates. When Mr. Langford presented his report to the Committee, they expressed their great satisfaction with the results; and, in addition to according him the customary vote of thanks, the Chairman said he hoped they would retain his services for many years.

The report came before the Town Council last Thursday, when some additional particulars were submitted. They showed that the cost of gas manufactured was reduced last year by £734, compared with the year 1905-6, notwithstanding the increased output of 5,484,000 cubic feet of gas. The repairs, renewals, and maintenance of works and plant were less by £922, chiefly due to the fact that the Committee have now paid off the whole cost of the carburetted water-gas plant, which has been done by annual instalments, instead of adding to the capital account. The slot consumers continue to increase; the amount received from this source being £7580, compared with £7307 before. Repairs and conversions of public lamps from flat-flame to incandescent burners cost £325 more than in 1905-6. The total quantity of gas sold amounted to £21,022, against £21,113. This was only about £90 less than in 1905-6, though the price of gas for motive power had been greatly reduced; some large consumers obtaining gas at 1s. 10½d. per 1000 cubic feet. The amount received from residuals was £4760—an increase of £113; while the fittings account produced £515, or an increase of £418. The yield of gas per ton of coal, independent of water or oil gas, was 12,260 cubic feet; the gas sold per ton of coal, independent of water or oil gas, was 11,496 cubic feet; and the gas unaccounted for, 6·24 per cent. of the make. The coke sold per ton of coal used was 11·06 cwt.; used as fuel for the retort-furnaces, 14·9 per cent. of the make; the oil used per 1000 cubic feet for water gas was 1 93 gallons; the tar made per ton of coal, 12 gallons.

DONCASTER CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The accounts of the Gas Department of the Doncaster Corporation for the year ending the 31st of March have just been issued. The revenue from the sale of gas to ordinary consumers (the price of which was reduced by 2d. per 1000 cubic feet on April 1, 1906) amounted to £15,556; and from prepayment consumers to £5546. The gas supplied to the public buildings and lamps, private lamps, and stove-rents increased the above-named amounts (less discounts and allowances) to £24,917; residuals yielded £7596; and the total revenue was £33,371. The chief items of expenditure were: Manufacture of gas (including repair and maintenance of works), £17,088; do. of sulphate of ammonia, £693; distribution (including repair and maintenance of meters, mains, and services), £2094; maintenance of stoves and fittings, £739; public light department, £1215; management and general charges, £1123. The total expenditure was £24,165; leaving £9206 to go to the net revenue account. The Gas Engineer to the Corporation (Mr. Robert Watson) recently submitted to the Gas Committee an analytical statement of the costs per ton of coal carbonized and per 1000 cubic feet of gas sold, as per the revenue account for the past financial year. It showed that the net cost of gas into the holder was £10,158; being at the rate of 9s. 8·4d. per ton of coal and 1s. 0·47d. per 1000 cubic feet of gas sold. The net cost of gas distributed was £15,705, or at the rates of 14s. 11·96d. and 1s. 7·29d. The gross profit, as stated above, was £9206, or at the rates of 8s. 9·54d. and 11·3d. Deducting the interest on loans, deposits, and sinking fund instalment, the surplus profit for the year was £8065, or at the rates of 7s. 8·46d. per ton of coal and 9 9d. per 1000 cubic feet of gas sold. The surplus profit was subject to the payment of £5000 to the borough fund and £1587 for cookers—the rest being for new mains and meters. The Gas Engineer also submitted a working statement for the past year. It showed that the total quantity of coal used was 20,943 tons, which produced 212,410,000 cubic feet of gas, or at the rate of 10,133 cubic feet per ton, of which 9353 cubic feet were sold, of an illuminating power of 17 candles. Of the total make of gas, 195,884,300 cubic feet, or 92·23 per cent., were sold; 3,232,400 cubic feet, or 1·52 per cent., used on the works; and 13,302,300 cubic feet, or 6·25 per cent., unaccounted for.

COVENTRY CORPORATION GAS UNDERTAKING.

In the last number of the "JOURNAL" (p. 47), we gave the principal figures in the annual report of the Gas Committee of the Coventry Corporation, which came before the City Council on the 2nd inst.

In moving the adoption of the report, the Chairman of the Committee (Mr. Batchelor) stated that the total quantity of gas sold was upwards of 764 million cubic feet—an increase over the previous year of 51 millions, or 7·23 per cent. This was made up, in round figures, as follows: Ordinary consumers, 30 millions; prepayment consumers, 20 millions; public lighting, rather more than half-a-million. The prepayment meters still grew in popularity; the consumption of gas through them having increased nearly 21 per cent. in the year. Coal cost 4d. per ton (net) less than in 1905-6; and though 1959 tons more had been carbonized, the cost had only been £30 higher. On the other hand, gas oil had gone up in price by ¼d. per gallon, or rather over 8 per cent.; and, owing to the augmented gas consumption, the quantity of this gas made during the past winter was double that of the previous similar period, which accounted for an increase under this head of £2173. It was the general impression that carburetted water gas was made because it was cheaper than coal gas; but this was not so. There might be times, when a low price was ruling for coke and the price of oil was low, when it would pay to make it; but during a period of normal consumption, when the number of retorts in use could be kept fairly constant, and average prices for residuals obtained, it paid best to shut down the water-gas plant. They were not making any of this gas now, as the retorts could supply the present demand; but in the depth of winter, when the maximum consumption was reached, it answered better to make all the extra gas in that plant than start special retorts for a short period, which was wasteful. The prices realized for residuals, except sulphate of ammonia, had been maintained. Fortunately, a greater yield of sulphate had been obtained per ton of coal carbonized; so that the result was slightly better than last year. The yield of gas had been lower than in the previous year, as many of the retorts were getting worn out, and expenditure on plant had been avoided as much as possible in view of the early transfer of gas making to Foleshill. The cost of manufacture had risen in slightly greater proportion than the increase in the quantity of gas made. The higher cost of carburetted water gas accounted chiefly for this; also the extra cost of running two works, as more foremen and workmen were required. The maintenance charges had gone up, owing to the removal of the carburetted water-gas plant to Foleshill. Rates, taxes, and public

lighting were higher; but the other items were much the same as last year. Bad debts had been exceptionally low—less than £25, which was a very small sum considering that the turnover was upwards of £127,000. There was a drop of only £488 in the receipts for gas; but there would have been an increase of £6144 had it not been for the reduction in the price of gas, which took effect as from the commencement of the financial year. This amounted to £6632 on the year's accounts. The average price of gas was lower now than it had been at any time since the Corporation acquired the undertaking, being 2s. 2·21d. per 1000 cubic feet. The next lowest price was 2s. 3·08d., which was for the year ending March, 1900. The Committee recommended that £2000 of the net profits should be voted to the relief of the rates, and that the balance of £1492 should be carried forward. The prospects for the current twelve months were not so good as they had been for the last few years, owing to the advance in the price of coals, which would have the effect of increasing the cost under this head by about £6000. This, however, would be somewhat reduced by the enhanced prices obtained for coke. The cost of gas oil would, it was feared, also be considerably augmented; and there was practically no residual product from this to reduce the additional cost. A large expenditure of capital would also take place at Foleshill during the current year; and it was estimated that the greater costs with the increased interest on capital would be about £5600. Against this, they anticipated lower maintenance charges; and if the present rate of consumption continued, they believed the new costs would be met. The Foleshill works were steadily progressing; and it was expected that the manufacture of coal gas would be commenced there within the next twelve months.

The motion for the adoption of the report was seconded by Mr. Player without comment.

A short discussion followed, in the course of which it was urged by Alderman Andrews that the policy of the Committee in selling gas at a lower figure than it cost to produce it, was a wrong one. The reduction in price had been apparently in favour of the large users to the extent of about £6000. Revising the price to this class of consumers was a financial mistake; and the small amount of profit made had shown that it was unsatisfactory. Alderman West, the Chairman of the Electric Light Committee, considered the profit made was very small, having regard to the turnover; it being less than 1 per cent. Mr. Poole urged that some concession should be made to small as well as to large consumers, and particularly to those using prepayment meters.

In the result, the report was adopted.

OSSETT CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The report of the Gas Manager of the Ossett Corporation (Mr. A. E. Mottram) for the year ending the 31st of March last recently came before the Town Council in the minutes of the Gas Committee. It showed that the make of gas in the period named was 111,751,000 cubic feet, of which 102,178,600 cubic feet were sold. This was an increase of 6,828,000 cubic feet in the former case, and of 7,938,600 cubic feet in the latter, compared with the year 1905-6. The increased consumption was at the rate of 7 per cent.; and the unaccounted-for gas was reduced to 8½ per cent. The quantity of gas made per ton of coal carbonized was 10,885 cubic feet, against 10,833 cubic feet. The gas sold was apportioned as follows: Ordinary meters, 60,576,000 cubic feet; slot meters, 20,171,700 cubic feet; public lamps, 8,928,800 cubic feet; engines, 6,163,300 cubic feet; cookers, 5,346,300 cubic feet; works, offices, &c., 992,500 cubic feet. The gross profit made was £7790; and the interest and sinking fund charges amounted to £6516—leaving a net profit of £1274, which has been applied in reduction of the suspense and depreciation accounts. The price realized for surplus coke was a very low one; but there was nevertheless an increased income of £300, owing to the success met with in breaking and distributing the coke locally. By this means the surplus coke was reduced 30 per cent. There are 3674 consumers by ordinary meters and 3081 by prepayment meters—a total of 6755, or 352 more than in the year 1905-6.

Appended was a table showing the cost of gas per 1000 cubic feet sold. The gross cost of production was 2s. 0·65d., compared with 1s. 11·95d. before. Residuals realized 8·46d. per 1000 cubic feet of gas, against 8·12d. This reduced the net cost, exclusive of capital charges, to 1s. 4·19d., against 1s. 3·82d. Interest and sinking fund payments amounted to 1s. 3·29d., compared with 1s. 5d.; making the total cost of production 2s. 7·48d., or 1·33d. less than in 1905-6, when it was 2s. 8·83d. Receipts from gas, meter-rents, &c., amounted to 2s. 10·50d. per 1000 cubic feet; leaving a profit of 3·02d., against 1·73d.

In moving the confirmation of the minutes, the Chairman of the Gas Committee (Mr. H. Robinson) remarked that they had had a record year in almost every sense. If the Council considered the gas-works as an instrument of production, as a profit-making machine, or from the standpoint of consumption indicating the loyalty and satisfaction of the consumers, their success was quite phenomenal, especially when it was remembered that the advance was made upon great advances every year since the works came into the hands of the Corporation. There was one thing they had to regret. The success had not been so great, and the prospects were not sufficiently favourable, for any concessions to be made to the consumers this year, as the Manager had fondly hoped, and the patience of their customers merited. What stood between the public and cheaper gas were the capital charges and the bad condition and insufficiency of the mains and services. The latter were still being found in an awful condition; but the capital charges were the great bugbear, and made him wish the Corporation had been pioneers in this business, or had been enterprising enough to purchase the gas-works twenty or thirty years earlier. These charges were to him like a huge monster with a voracious appetite. This year it had swallowed in interest £4537, and in redemption of loan £1979—a total of £6516; and yet it was not satisfied, for next year they would have to feed it with an almost equal amount. Though the feed was getting gradually less, they would not have an appreciable difference for four or five years yet. During the past year, 111,751,000 cubic feet of gas had been made; showing that the works were a veritable hive of industry. The sale was 102,178,600 cubic feet, leaving unaccounted for 9,572,400 cubic feet, or 8½ per cent., being 1½ per cent. less than before. Compared with the year preceding the acquisition of the works by the Corporation, these figures were striking, and showed an increased make of 27,525,000 cubic feet, an increased sale of 31,335,000 cubic feet, and a decreased leakage of 3,810,000 cubic feet. How long this could be kept up, he did not know; but they seemed to be setting themselves a standard which would be difficult to live up to. Proceeding to refer in detail to the working in the past year, Mr. Robinson said that 2,295,100 cubic feet more gas had been used for engines, which was a welcome increase, as this was a field with nearly virgin soil. Consumption by cookers had gone up by 809,200 cubic feet, which was eloquent testimony; and it seemed to him that the engagement of a lady last year to instruct consumers, was money well spent. He concluded a long and interesting speech by asking the public to continue to display their loyalty and patience, and promising that they should benefit at the earliest opportunity. The minutes were confirmed.

YEAR'S WORKING AT HEREFORD.

In his first annual report on the Hereford Gas-Works, Mr. W. W. Townsend, the Engineer and Manager, says that, in spite of severe competition, the amount of gas sold during the past year was 125,959 cubic feet more than in the preceding twelve months. The consumption by ordinary meter decreased by 663,660 cubic feet, and that by contracts 425,050 cubic feet; but these decreases were made up by increases of 1,000,220 cubic feet by slot meters, and 214,449 cubic feet by public lamps. The gross profit for the year is £4262, against £4614 in the preceding year. The revenue from the sale of gas by ordinary meters is £274 less, owing chiefly to the fact that the price of gas was lower in the June quarter than in the same quarter of the year previous. Residual products realized £200 less, owing to the fact that less coal was carbonized, and therefore less coke was sold. The price realized for coke was also slightly lower. The profit on fittings was £376, against £274. It has been considered advisable to write down the values of stocks; and this has affected several of the items of expenditure. In order to compare this year's figures with those of previous years, it is necessary to deduct from the apparent expenditure the sum written off stock for depreciation. The gross expenditure shown in the accounts is £16,948. Deducting £925 written off for depreciation, the actual expenditure for the year is £16,023, against £15,774 for the previous year. Coal cost £127 less, though the average price per ton was higher, owing to reduced leakage and better working results. Maintenance of works cost £1856, against £1582. The increase is accounted for by the repairing of the sulphate plant and the Manager's house at the works, and the relaying of the drainage system. Repairs of mains and services cost £207 less. The only other items calling for mention are £61, the cost of the exhibition, and £76 the cost of fixing gas-fires on hire. As to the first, the amount of profit on fittings and the extra revenue for hired stoves which resulted from business done at the exhibition, more than repaid its cost. The cost of fixing hired gas-fires is rather heavy, because the system was started in November last; and the revenue from the hire of the stoves only took effect in the March quarter. He anticipates in future that the amount received for hire will cover the cost of fixing and repairs, as well as depreciation.

The working statistics show that the gas made was 129,492,000 cubic feet; and the coal carbonized 11,743 tons. The make of gas per ton was 11,026 cubic feet, as compared with 10,969 cubic feet in the preceding year. The unaccounted-for gas was 7·9 per cent., as against 8·56 per cent. The number of ordinary consumers is 1756, and of prepayment-meter users 2156; the figures for the previous year being 1730 and 2077 respectively.

Mr. C. Witts, the Chairman of the Gas Committee, in moving the adopting of the report by the Council, said the Committee appreciated the new Manager; and they believed they had selected the right man. The drop of £352 in the profits of the past year compared with the previous twelve months was due to the reduction in the price of gas running for a full year instead of only for three-quarters. Though they had sold 123,000 cubic feet more gas, they had consumed 300 tons less coal. This had been possible owing to the stoppage of the leakages—a thing they had been trying at for some years. The works and plant were now valued at £143,452, upon which they had a loan liability of £32,390; so he thought it would be admitted that they had a very valuable property. Last year they made 11,026 cubic feet of gas per ton of coal, against 10,969 cubic feet the previous year. He would like to mention that on the ordinary meter consumption there was a drop of a million cubic feet, which showed that they were losing some of their best customers. In the past three years the price of gas to ordinary consumers had been reduced 6d. per 1000 cubic feet, which took away a profit of £2500; they had also reduced the cost to users of penny-in-the-slot meters 4d. per 1000 cubic feet, which made up practically the same amount.

Employees' Outings.—We are now in the season of employees' annual outings, and particulars of several have come to hand. The employees of the Richmond Gas-Stove and Meter Company, Limited, had an excursion to Dublin, where they spent Saturday, the 29th ult., pleasantly and profitably in visiting the International Exhibition, the sights of the city, the Company's show-rooms, &c. The employees of Mr. W. Edgar, of Hammersmith, had their outing and sports the same day at Godalming; dinner being served at the King's Arms Royal Hotel. Several prizes given by Mr. and Mrs. Edgar and their visiting friends were keenly competed for. The staff of Messrs. J. & W. B. Smith, of Farringdon Road, went to Clacton-on-Sea on the same day; the party numbering about a hundred. Dinner was provided at the Brunswick Hotel—Mr. W. D. Cork in the chair. The principal of the firm (Mr. J. G. Watkinson) and Manager (Mr. Ferguson) were present.

GAS AND WATER ADMINISTRATION AT BARRY.

Report by Mr. Robert Porter.

A Special Meeting of the Barry Gas and Water Committee was held on Monday of last week, for the purpose of considering a report by Mr. Robert Porter, of Elland, who had been engaged to inquire into the management and general administration of the gas and water undertakings.

The report was a lengthy document, and in it Mr. Porter stated that Mr. F. M. Harris, the Gas Engineer and Manager, afforded every facility for his inspection of the books, works, and district. The site was at a suitable altitude for giving an efficient supply of gas to the district; and the good railway siding accommodation was admirably situated for the receipt of coal and other material. The very low percentage—2½—of gas unaccounted for during the year was sufficient indication that all the Council's distributing plant was in excellent condition. The capital of the gas undertaking was approximately £124,241; being at the rate of £10 6s. per ton of coal used, or £1 2s. per 1000 cubic feet sold. This capital was somewhat excessive; and very careful engineering would be required in the future to prevent the burden increasing. In fact, it was of the utmost importance that strict supervision should be kept on any charges placed to this account. The works were purchased from a Company in 1894. In that year the sale of gas was about 30 million cubic feet; the capital being, therefore, at the rate of £2 2s. 7d. per 1000 feet sold. The increased sale of gas since that year was phenomenal; and having regard to the rapid growth of the district, and the reserve power in some portions, the additions to this account might be deemed satisfactory. During the last eleven years, £21,382 had been taken from revenue account to subsidize some other funds of the Council. Had this sum been applied to the liquidation of the capital burden upon the gas undertaking, the capital would have been reduced to 17s. 2d. per 1000 cubic feet sold, and the annual amount required to pay interest and sinking fund reduced at the present time by £1520. This item alone would have enabled the Council to reduce the price of gas by 3d. per 1000 cubic feet. There appeared to be no justification for the gas consumer having to maintain the gas undertaking, build up a fund to liquidate the whole of the capital in less than thirty years, and at the same time provide a yearly additional sum of £1520 for the relief of the expenditure of other departments. This policy would lead to extravagance in the departments subsidized, and inflate the price charged for gas. The first impression, on casually looking round, was that the works and plant were in a very neglected condition; that the upkeep and repairs had been neglected for some time, and the place was somewhat under-manned. The chief complaint of the Manager was that, at the special request of the Committee, he had to dispense with the labour required to keep the concern in a thoroughly satisfactory condition. The sum allowed for the maintenance of the undertaking in an efficient manner was totally inadequate; and he knew of no concern in the country thoroughly maintained under 6d. per 1000 cubic feet.

Dealing with the carbonizing plant, Mr. Porter said that the retorts were fired with excellent regenerative furnaces, and well equipped with elevators and conveyors for handling the coal and coke, with a view of reducing the cost of labour to a minimum; and the whole benefits accruing from the introduction of this modern plant seemed to be enjoyed by the Council's workmen. The amount of gas produced per 24 hours was 78,000 cubic feet per bed with three men. This quantity was produced in many works under the old method of hand-charging; and fully £500 per annum ought to be saved in wages on this account. The workshops were badly kept, and evidence of neglect was apparent. The stores lacked personal supervision, and the rapid growth of gas consumption demanded a reorganization of the governors. The offices and residence were substantial and well arranged. The statement of the finances of the department showed that there was a surplus of £3054; but if the proper sum had been paid on repairs and renewals of works, this would be reduced to £1321. Generally, the capital charges were excessive; and the capital account ought to be closed for some time, and all alterations and extensions paid for out of revenue, so as to place the undertaking on a sounder financial basis. Having regard to the financial burden on the ratepayers, he was of opinion that economy ought to be practised in the matter of public lighting. In fact, this could be effected without interfering with its efficiency. By using incandescent burners throughout, and reducing the lighting hours, the cost to the ratepayers could be reduced by about £800 per annum for gas only. The question as to whether the best coal and best terms were obtained, could be better answered by the Manager and the Committee. The Manager did not favour the use of the coal at present purchased; and the result obtained certainly confirmed his contention.

Mr. Porter's conclusions were as follows: "From the foregoing, it will be observed that I am of opinion that the department is over-capitalized; that there is considerable room for improvement in the management of the undertaking; that the management does not receive the consideration from the Committee that is conducive to successful co-operation. The strained relationship between the Committee and Manager, the unwarranted interference of the Committee in matters of detail, and the utter neglect to act upon the advice given by the Manager in the matter of administration, is responsible for much of the mismanagement. I am of opinion, too, that the administration of the department would be better carried out by an entirely separate Committee (responsible to the Council for the department alone), who, at their meetings, would employ the time in discussing with the Manager the broader question of finance and administration, results obtained (favourable and otherwise), and the best methods of developing the undertaking, instead of drawing up pettifogging rules to govern the conduct of their Manager in the discharge of his duties. Mutual confidence between management and Committee would do much to improve, and put upon a sound basis, this department."

A lengthy discussion took place upon this portion of the report; and the matter was then adjourned for a fortnight, in order that a statement might be prepared by Mr. Harris. This and the report on the water undertaking will then be considered.

GAS AND ELECTRICITY AT SHEFFIELD.

Sir William Clegg and the Gas Company—The Financial Position of the Electricity Undertaking.

It may be remembered that in the course of the proceedings at the dinner of the members of the Incorporated Municipal Electrical Association on the occasion of their recent annual convention in Sheffield, as reported last week (p. 49), Sir William Clegg, referring to the competition to which the electric light undertaking of the Corporation had to submit owing to the low price of gas, suggested that it might be desirable to open up negotiations with the Gas Company with the object of purchasing their concern, "if they could agree upon a price." It was at first thought that this was only a little bit of after-dinner oratory on the part of Sir William; but, according to what transpired at an interview with a representative of a local paper, he brought forward his proposal in all seriousness. It was put to him whether the competition between the Electric Light Department and the Gas Company was the sole reason for it; and he promptly negatived such an idea—remarking that it was merely one of the elements which induced him to throw out the suggestion. He said that he did not advocate the Corporation purchasing the gas-works at once; but he thought the time would come—perhaps in a very few years—when the Council would deem it advisable, in the public interest, to acquire the undertaking, so as to work it in combination with the electric light. Other corporations had both gas and electric light under their own control; and, personally, he considered it could scarcely fail to be advantageous if a similar arrangement could be carried out in Sheffield. "Of course," he said, "I want it to be distinctly understood that, so far as the present management of the gas undertaking is concerned, it could not be in better or more competent hands. The Directors, past and present, have always materially considered the interests of the public, and, without any pressure at all from outside, and entirely of their own motion, have from time to time reduced the price of gas. Any negotiations would have to be absolutely on friendly lines. I make no suggestion at all that we should go to Parliament for the purpose of compelling the Gas Company to sell their undertaking to us. Unless we can persuade the Directors and shareholders to sell voluntarily, it would be a waste of time our pursuing the matter further. Personally, I do not think we should be able to present a case to Parliament sufficiently strong to induce them to grant us compulsory powers of purchase. We tried it many years ago; but we had absolutely no case, and the Parliamentary Committee who heard it struck out the clause without even calling upon the Gas Company to answer the arguments put forward. Nothing has taken place since then to alter the position of affairs; so the arrangement must be quite spontaneous and voluntary, and you must persuade the Directors and shareholders that parting with the undertaking is to their interests as well as to those of the community." Discussing the plan of purchase, Sir William pointed out that this would depend on mutual agreement; but his suggestion would be the adoption of similar principles to those acted upon when the Council acquired the water undertaking. Instead of a huge sum being paid them, the shareholders in the Water Company accepted terminable annuities, redeemable, if the bolders of the stock thought well to sell, in sixty or ninety years. The plan had, he said, worked very well indeed in the case of the Water Company; and there was no reason why a similar plan should not prove equally advantageous to the Corporation as well as to the Gas Company. He added: "The scheme that has been floating in my mind, and concerning which I threw out the suggestion, is one worthy, I think, of consideration; but the beginning and the end of it is of the most friendly description so far as the Gas Company are concerned. To carry it out, it must be with their assent and approval. If they fail to see their way to do it, I should not be in favour of trying to compel them." Questioned as to whether municipal control would be likely to have the effect of raising the price of gas, Sir William replied by instancing his policy with regard to the tram service. "We should have to make absolutely certain," he said, "of the payment of all outgoing expenses, and the provision of a contingency fund to meet unforeseen circumstances; but having done that, I should consider the question whether the price of gas could not be further reduced, rather than create very large profits for the relief of the rates. I certainly should not follow the example of Manchester, where the gas consumers have to pay a pretty high figure in order that very large profits can go for the relief of the general rates. I call that bad municipal policy." In conclusion, he cited the success of the tramways and the water-works as two examples of the value of municipalization, and said that if the gas undertaking could be secured, he was convinced that it, too, would prove an exceedingly profitable investment for the city.

Referring last Thursday to Sir William's proposal, the "Sheffield Daily Telegraph" said that, if he really meant to commit his party to it, they would have a rough passage before them. In order that he might start fair, our contemporary put one or two questions to him which it was thought he might be interested to answer. The writer worked out the prices charged by the 39 local authorities in Yorkshire who own gas-works. There are 14 of them charging from 3s. to 3s. 9d. per 1000 cubic feet; 19 charging from 2s. 6d. to 2s. 11d.; and six charging from 2s. 1d. to 2s. 5d. There are none under 2s. 1d. The average is 2s. 10d., which is a good deal more than double the Sheffield price. "It is obvious, therefore," says the writer, "that municipalization would confer no benefit on the community so far as price is concerned. Nor can it be claimed that we must purchase the undertaking in order to prevent a rise in prices. Parliament has safeguarded our interests in that respect. In the first place, the dividend cannot exceed 10 per cent.; and, secondly, if the price went up to that of the average of the Yorkshire local authorities—that is, to 2s. 10d.—the dividend would automatically fall to 9 per cent. If the charge ran up to 3s. 3d. the shareholders would receive only 7 per cent. So that, within certain limits, the shareholders are as keenly interested as are the consumers themselves in keeping the charges down." This is the first matter for Sir William's consideration. The only reason that has so far been suggested for the proposal is that cheap gas is too keenly competitive with electric light. The position seems to our contemporary to be this: Sir

William says to the Gas Company: "Our electric light cannot compete with you because your gas is so cheap. Kindly raise your prices. If not, we may have to buy you out, so that we can raise them."

Speaking of the electric light, there seems to be something mysterious about the finances of this undertaking which ought to be explained at the meeting of the City Council to-morrow. Attention has already been called to the matter by two of the members; but without success. They will, however, renew their efforts to clear up the mystery. Put concisely, the point is this: According to the last published abstract of the accounts of the Corporation, the salaries paid in the Electric Lighting Department amount to £5201 a year; but in the electric lighting accounts just issued for the year 1906-7, only £1348 is charged to salaries. What about the remaining £3853? In the published accounts, the item of "Salaries of General Manager, Deputy Manager, Secretary, and clerical staff," stands at £1348; but the salaries of only the three officials named amount to £1425, or £77 more than the above total. Against the £1348 purporting to cover the whole of the salaries of the department, a sum of £5201 was actually paid. An explanation of this discrepancy will be sought to-morrow. In the meantime, an announcement has been made which, if carried into effect, will deprive the electric light undertaking of its most ardent supporter. The Lord Mayor, who is the Chairman of the Electric Light Committee, has requested the Town Clerk to intimate to the City Council that he has tendered his resignation; and he has declined to give any explanation for taking this step until he can do so in the City Council.

ELECTRICITY SUPPLY IN LONDON.

London County Council and their Bill.

At the Meeting of the London County Council last Tuesday, the Parliamentary Committee presented their report upon the circumstances leading up to the rejection by the Hybrid Committee of the House of Commons of the Electricity Supply Bill. A summary of the report appeared in the "JOURNAL" for the 2nd inst. (p. 49). The Committee recommended—"That, in the opinion of the Council, it is a matter for deep regret that the London County Council (Electricity Supply) Bill, 1907, has been rejected, thereby depriving the elected representatives of Municipal London of the opportunity of securing the provision of a cheap supply of electricity subject to public control." Mr. W. Peel (Chairman of the Committee) moved the adoption of the recommendation. Mr. H. Gordon moved, as an amendment—"That, with a view of ascertaining what steps should be taken to place again before Parliament a comprehensive scheme for the development of electricity for London and adjoining districts, the Highways Committee be instructed to convene a conference of the various Local Authorities concerned, and to report the results of such conference to the Council as soon as possible." He said the proposals contained in the Bill were most anomalous and almost without precedent, and could not in any sense be said to constitute a comprehensive scheme as asked for by the Committee of 1906. Parliament was amply justified in rejecting the Bill. One of the most regrettable features of the inquiry was the spending of public money by one public authority in opposing another; and he thought the best way to prevent this in the future was to attempt to come to some arrangement with the Local Authorities round London. Mr. W. C. Johnson seconded the amendment. After some discussion, the amendment was lost, on a division, by 77 votes to 41—a majority of 36. The recommendation was thereupon carried.

Financial Difficulties of Borough Councils.

At the Meeting of the Shoreditch Borough Council last Tuesday, the Lighting Committee reported that they had inquired into the working and financial position of the electric light undertaking. They found that in 1897, when the streets were entirely lit by gas, the cost of public lighting was £6244; whereas last year it was £13,295. Of the latter sum, £9212 was spent for electricity. The Committee recommended that the illuminating power of the arc lamps in 24 streets should be reduced by 20 per cent., which would effect a saving of £720 per annum. The Committee went on to say that, as regards depreciation, they were of opinion that the redemption of debt account or sinking fund payments could not be regarded as equal to a depreciation fund, unless the life of the plant coincided with the term of repayment; and as the term of nearly all the loans at Shoreditch was 42 years, the department had not, up to the present, accumulated sufficient funds to meet the requirements of a depreciation fund. Every effort should be made to build up a reserve fund for this purpose. In the course of the discussion which ensued, Mr. Sherratt pointed out that the reason why the undertaking had not been successful was, in the first place, because the gentlemen who composed the first Lighting Committee did not know the value of money, and knew nothing about electricity. Another reason was because most of the members of the Committee had to work for their living, and could not devote sufficient time to the duties devolving upon them. Moreover, it seemed that gas was really cheaper than electricity. The report and recommendations were adopted.

In his report on the audit of the accounts of the Islington Borough Council, Mr. A. Carson Roberts, the District Auditor of the Metropolitan Boroughs, says the charge made for electric current distributed to the public lamps, apart from the cost of providing or maintaining the lamps, &c., is at the rate of 3·31d. per unit, or about twice as high as the average amount charged in other Metropolitan Boroughs. At the meeting of the Borough Council last Wednesday, the Finance Committee reported, in regard to these adverse comments by the Auditor, that they were fully in accord with the views formerly expressed by him that the charges for current supplied for street lighting were greatly in excess of what was fair and reasonable, and that the undertaking was thereby heavily subsidized by the general rate. They were further of opinion that so long as this state of affairs existed no reduction in the charge for private lighting should have been made, unless accompanied by a corresponding reduction in the charges for street lighting, altogether apart from any question of increased consumption. The Committee therefore held that the reduction made by the late Borough Council for private lighting was not justified. The Committee further endorsed the suggestion by the Auditor that a charge should be made on the electricity revenue in respect of the services of the Town Clerk, Borough Treasurer, and Cashier. The Committee went on to say that the accounts showed that the so-called electricity reserve fund of £13,306 did not represent more than was necessary for the purposes of working capital; and they were of opinion that it was desirable that this fund should be so employed, instead of additional loan capital being raised for the purpose. Until the amount of revenue balances was in excess of that required for working the undertaking, it was impossible to create an invested reserve fund.

METROPOLITAN WATER BOARD.

The Financial Statement.

At the Meeting of the Metropolitan Water Board last Friday—Sir MELVILL BEACHCROFT in the chair—the annual financial statement was submitted.

Lord WELBY, the Chairman of the Finance Committee, said that last year he reported to the Board that they could not state definitely the result of the finance for the year 1905-6, but they expected a surplus of £11,567. The audited accounts showed one of £11,838. In regard to the year 1906-7, they estimated the income at £2,814,510, and the expenditure at £2,782,060; leaving a surplus of £32,450. The estimates as originally presented provided for an expenditure of £2,765,017; and supplemental votes of £17,043 brought the expenditure up to £2,782,060. The actual result gave an income of £2,837,550, and an expenditure of £2,804,090; leaving a surplus of £33,460. These figures had not been finally passed by the Auditor; but he thought he could assure the Board that they would be approximately correct. A comparison of actual results with the original estimates showed an increase on expenditure of £39,000, against an increase of income of only £23,000. This difference was serious when they considered the small margin of income over expenditure at their disposal; and the Finance Committee hoped the executive committees would endeavour to confine within the narrowest limits additional expenditure beyond that provided in the estimates. He then drew attention to the result of their finance during the period during which the Board had been responsible for the supply of water to the Metropolis—viz., 2¾ years from June, 1904, to March, 1907. On the first broken year to March 31, 1905, there was a deficit of £9550; the second year gave a surplus of £11,838; and for the third year they expected a surplus of £33,460—resulting in a net surplus over the whole period of £35,748. The sum they considered should be payable every year towards the liquidation of debt was £83,000; and up to the present the amount which might be so applicable was only £12,000 a year. The Board had, in addition, set aside out of revenue £20,950, the statutory sinking fund on the new debt which the Board had incurred since they came into power. As to the estimates for the current year, it was reckoned that the income of the Board would be £2,906,420—an increase of £92,000 compared with that for 1906-7; and the expenditure at £2,896,060, or an increase of £114,000. The surplus for the current year was only £10,360. A contingent provision of £11,150 was made for the first time in the estimates to meet supplemental expenditure; but the Board would have observed the large amount of supplemental expenditure incurred in 1906-7, amounting to nearly £40,000. This was an ominous feature in the Board's finance; and it was evident that if great care were not taken by the executive committees in refusing supplemental expenditure, a deficit—perhaps a heavy one, and in all probability a permanent deficit—was unavoidable, with its necessary consequence of a charge on the rates. The debt of the Board on March 31, 1906, was £47,589,713, and at March last £47,945,349—an increase of £355,636. The amount of capital expenditure required for 1907-8 was estimated at £933,000, against £985,000, the capital expenditure incurred up to March 31, 1907. Comparing the financial situation of the Board with that of the Water Companies in 1903-4, the last year of their administration, Lord Welby stated that, whereas the income of the Companies in the year named was £2,669,302, that of the Board for the current year was £2,906,420—an increase of £237,118 in four years. The expenditure of the Companies, including dividends, directors' fees, &c., was £2,669,302, the same as their income; and the estimated expenditure of the Board for 1907-8 was £2,896,060, which was an increase in four years of £226,758, or about £10,000 less than the increase of income during the period. The cost of the Companies' staffs was £154,700; while the Board's expenditure on this account for 1907-8 was estimated at £132,450—a decrease of £22,250. In conclusion, His Lordship said that, though he did not consider the statement was unsatisfactory, it was one which should impress upon the Board the necessity for very careful administration of their finances.

The estimates were approved.

The Works and Stores Committee presented, in the usual tabulated form, particulars relating to the supply of water in the Metropolis in the month of May. They included the following figures: Average daily supply of water, 218,787,000 gallons; number of houses supplied, 1,064,513; estimated population, 6,911,506; mean supply per head per day, 31·6 gallons; water in store in impounding reservoirs at the end of the month, 8733 million gallons, against 7045 millions at the corresponding time last year.

Colchester Water Supply.—At the meeting of the Colchester Town Council last Wednesday, the Water Committee submitted the report of the Auditor (Mr. R. L. Impey, F.C.A.), who stated that the accounts showed a profit on the past year's working of £2320, compared with £2992 the previous twelve months. The profit, added to the balance brought forward (£2747), made a total of £5067. From this, a contribution of £2550 had been carried to the urban district rate; leaving a balance of £2517 to be carried forward.

MANCHESTER CORPORATION WATER SUPPLY.

The Capacity of the Works and the Demands upon Them.

After a lapse of about thirteen years, the members of the Manchester City Council recently visited the water-works at Lake Thirlmere. On arriving at Windermere, they were conveyed to the Prince of Wales Lake Hotel, where luncheon was served. The subsequent journey to Thirlmere was broken first at the settling-pools on the line of the aqueduct through which the water is carried to Manchester, and again over Dunmail Raise at the straining-well at Wythburn. The operations going on there were fully explained by officials of the Water Department, who acted as guides during the journey. Afterwards, passing over the roads on the east side of the lake, a halt was made on the edge of the large area of land known as Shoulthwaite Moss, which is gradually being reclaimed by the Corporation, and by a system of complete drainage has already been transformed from useless mossland into fairly fertile pastures. The embankment at the north end of the lake was also inspected, together with the overflows, waste-water tunnel, and watercourse, gauge-basin, and valve-houses, and all the arrangements for delivering the compensation water from the lake into St. John's Beck. The quantity of water discharged into St. John's Beck before the diversion of the additional drainage area into the lake was stated to be 4,126,425 gallons in 24 hours. When the lake has been raised to the full extent of 50 feet, its area will be 793 acres, and its capacity 8135 million gallons.

On the return journey, dinner was provided at the hotel. Sir Bosdin Leech, on behalf of the Water Committee, welcomed the visitors, and expressed the hope that members of the Council who were not associated directly with the Committee would have gained some knowledge of the undertaking under their supervision. After a reference to the history of the early water supply of Manchester, he went on to say that it was sixty years since the Corporation first undertook the supply of water to the city. Before that, the service, such as it was, was in the hands of the Manchester and Salford Water Company, who delivered about 3 million gallons a day, obtained from the drainage-ground of the Gorton reservoirs, and supplemented by a supply from the Stockport Canal and a well, and a further supply from the River Medlock at Holt Town. These works were acquired by the Corporation, and had cost £533,561. Knowing the insufficiency of the supply, the Corporation obtained powers to carry out the works at Woodhead. The supply from this source was first delivered to the town in 1851. The consumption per day at once commenced to increase, and grew at a rapid rate, till in 1855 it was 8 million gallons per day. The completion of the works at Woodhead led up to the construction of the large service reservoirs at Audenshaw in 1875; thus finishing the Longdendale supply, which had cost £2,835,000. Ullswater and Haweswater were first suggested as a combined scheme with Liverpool for increasing the supply. But this idea did not find support; and in 1876 it was decided to adopt Thirlmere as an independent source for Manchester, and, in connection with the scheme, to purchase the entire watershed of 11,000 acres. By way of showing how the demand for water has increased since the supply was undertaken by the Corporation, Sir Bosdin Leech gave the following figures:—

	Consumption. Gallons per Day.		Annual Revenue.
1860	11,000,000	..	£71,507
1870	15,000,000	..	130,340
1880	18,000,000	..	196,696
1890	22,500,000	..	232,675
1900	32,000,000	..	284,944
1906	37,000,000	..	362,571

The delivery of water from the lake was, he said, divided into five instalments, each of 10 million gallons a day. Two of these were now available; and the expenditure on the works had reached about £3,500,000. The lake had been raised 35 feet above its original level, and when the entire works were complete the total yield would be 50 million gallons a day. The works were opened and the first instalment of water was delivered to Manchester in October, 1894. The population now supplied reached about 1,200,000 persons.

LIVERPOOL CORPORATION WATER SUPPLY.

Chief Engineer's Annual Report.

We gather from the annual report of the Chief Water Engineer of the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) that the total volume of water delivered from the works of the Corporation during the year 1906, including statutory compensation waters to rivers in Lancashire and Montgomeryshire, was, in gallons, 17,777,440,000; in cubic feet, 2,848,948,000; in tons, 79,364,000. The consumption of water within and around the city amounted to 9,643,087,000 gallons, compared with 9,854,442,000 gallons in 1905; and the quantity supplied outside the compulsory district was 186,580,000 gallons, against 189,130,000 gallons to Chorley, and 971,379,000 gallons against 781,822,000 gallons to other localities. The total figures were thus 10,801,046,000 gallons, against 10,825,394,000 gallons. The sources of supply were: Vyrnwy, 5,759,995,000 gallons; Rivington, 3,785,644,000 gallons; and wells, 1,216,461,000 gallons—together with 38,946,000 gallons of salt water. The additional number of new houses and other new premises supplied with water in the Liverpool district during the year was 3463. The number of houses pulled down or from which water was withdrawn was 975; leaving a net number of 2488 additional water tenants. The total number of tenants on the rent-roll of the water account at the end of the year was 195,535. The total length of additional distributing and fire mains laid was 13 miles; and the number of new hydrants fixed was 341, as well as four others which were substituted for fire-plugs, The total number of fire hydrants in the compulsory area is now 11,646. There are also still remaining 824 of the old-fashioned fire-plugs, which are being gradually replaced.

With respect to the quality of the water, monthly chemical examinations of samples taken from the several sources of supply were made by Professor J. Campbell Brown; and bacteriological analyses were made by Professor Sir Rubert Boyce, F.R.S., at the Thompson-Yates Laboratories of Liverpool University. Professor Boyce's report is to the effect that the examination showed that the very great bacterial purity of the water supplied to Liverpool had been well maintained. During the year, 25 special examinations were made of the Rivington water, and of about 60 samples taken from the surface of the strainers in the tower at Lake Vyrnwy and from the lake itself—forming part of an investigation as to the origin and character of the deposits found in the aqueduct between Vyrnwy and Oswestry. As soon as the investigation has been completed, a full report is to be laid before the Water Committee.

The total capital expenditure on the water-works to Dec. 31 last was £6,397,674, of which £578,684 was spent in respect of the Harrington and Bootle Companies' works; £71,056 on the Green Lane works; £1,113,374 on extensions of home works (wells, service reservoirs, and mains); £1,700,136 on the Rivington works; £30,254 on the Chorley works; and £2,904,170 on the Vyrnwy works. The income for the year amounted to £333,382, made up of £70,632 from domestic water-rents, £101,599 from the public water-rate, £101,140 from trade and miscellaneous supplies and receipts, £33,404 from shipping supplies, £21,133 from supplies to local bodies, and £5474 from the Chorley works.

Referring to applications for supplies in bulk, Mr. Parry remarks that in the twenty years that have elapsed since the passing of the Act of 1887, very few applications have been received for temporary supplies from places outside the Liverpool area. When communities are short of water, they naturally want to go to a source on which they can permanently rely, not only because of the vital importance of the subject, but also because of the increasing difficulty and expense of procuring new supplies in a country which has a growing population. At the same time, the risk of Liverpool terminating any agreement made (under the section reserving to the Corporation the right to determine the same on giving such notice as they think proper—not being longer than five years), is exceedingly remote. Liverpool is now supplying more than a million people with water. The total number of supplies in bulk from the Rivington and Vyrnwy works is 43, and a list of them is given in an appendix to the report. An important question has arisen in connection with the supply to the town of Chorley, which has outgrown the resources of the works authorized by Parliament; and it has been necessary, in order to maintain a constant service, to give assistance from the Liverpool reservoirs at Rivington. The population of Chorley has more than doubled since the undertaking was acquired, and the demand for water is rapidly increasing. Plans for extensions and reconstructions are in hand.

NEW WATER-WORKS FOR LOUGHBOROUGH.

Last Wednesday, the new storage and filtration works which have just been completed, at a cost of about £6000, for the Loughborough Corporation, were formally opened. It was intended that the ceremony should be performed by Mrs. J. Cartwright, the wife of the Chairman of the Water Committee; but, owing to unfavourable meteorological conditions, she could not leave her carriage, and had to enlist the services of a deputy in the person of her husband. Nevertheless, a numerous and representative company accepted the invitation issued by the Mayor (Alderman T. Mayo) to be present. Leaving Nanpantan, the party drove to the site of the reservoir, which has been constructed to impound 500 million gallons of water. On arriving, they partook of "high tea," under the presidency of the Mayor, at the close of which some particulars of the works were furnished by Mr. F. W. Hodson (son of the late Mr. George Hodson), under whose supervision they have been carried out. He said they had now increased their daily supply to 2,300,000 gallons, available from the Blackbrook and the Nanpantan works; and increased filtration accommodation was therefore an absolute necessity. It had always been considered inadvisable to divide the filtration, and for this reason they had added the new beds to those already in existence. For this purpose 2¾ acres of land had been purchased; and each of the two new filter-beds was as large as two of those originally provided. The new beds were 78 feet long and 75 feet wide, with an area of 650 square yards. In addition, a large pure-water tank had also been built, having a capacity of upwards of 280,000 gallons. This was part of a scheme which had been formulated to deal with the whole of the water as the requirements of the town grew. When completed, there would be in all eight filters. Everybody knew how wet, cold, and miserable the season had been; and yet during the eight months they had been storing at the reservoir they had had less than a normal flow in an average season. They found that only one month—June—had sent down the stream into the reservoir a quantity of water more than was due to the month. It was the winter flow at Blackbrook which supplied the water for storage purposes. This was a period during which, as a rule, they obtained 75 per cent. of the year's flow; and during the months of December, January, February, and March they were considerably below the average. In fact, owing to the deficiency in these months, they were 25 per cent. short of their expected total. They had anticipated that the reservoir would be overflowing in April last; but, instead of this being the case, they were still requiring a considerable quantity of water.

PLYMOUTH CORPORATION WATER UNDERTAKING.

The Annual Visit to the Works.

The members of the Plymouth Corporation, together with the principal officials and other persons, assembled at the storage reservoir at Burrator last Wednesday, on the occasion of the annual "Fyshynge Feast." Attention was drawn to the fact that a number of minor improvements had been carried out during the year, chiefly at the

intake of the reservoir. As is customary, the party assembled at the intake and drank in water from the reservoir "to the pious memory of Sir Francis Drake," the constructor of the leat which was the beginning of the water-works; and then in wine the toast: "May the descendants of him who brought us water never want wine."

Later in the day, there was a dinner at which the Mayor presided. Mr. C. H. Tozer, the Chairman of the Water Committee, congratulated the town on the possession of a magnificent storage reservoir; and referring to the works which had been carried out during the year, said that the continuous record which was being obtained at the gauging station would be of great use if any further reservoir works should be contemplated. They had abundance of water in the reservoir—sufficient, indeed, for the supply of Devonport and Stonehouse and the surrounding districts as well as Plymouth. Mr. F. Howarth, the Water Engineer, gave some statistics as to the progress of the undertaking. The income was still on the up-grade, and amounted last year to £32,000; the increase in the past seven years having been £7478. On the other hand, the expenditure was decreasing; and there had been a saving on maintenance and management during the past year of £460. The gross profit was £22,306—an increase of £567; while the interest and sinking fund amounted to £17,581. This left a net profit of £4725—an increase of £711. In the last seven years, the profit had augmented by £1514. The total length of mains was 130¼ miles; the extension during the past year amounting to 2¼ miles. The new supplies added numbered 745; and the total number was about 20,000. Though progress was being made with the checking of waste, the consumption was still high. The total was 5,600,000 gallons per day, compared with 6,250,000 gallons daily with a smaller population seven years ago. This represented a saving of about 8 gallons per head per day; but the waste of water still amounted to between 10 and 11 gallons per head.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual general meeting of the Hawick Gaslight Company was held yesterday—Mr. R. Noble, the Chairman, presiding. In their report, the Directors stated that they regarded the statement of affairs and balance-sheet as most satisfactory. They had recently gone over the works, and found them to be maintained in a state of efficiency. Contracts for the supply of coal for the ensuing year had been entered into on favourable terms. They recommended that the price of gas be retained as at the present—2s. 6d. per 1000 cubic feet—and that the rebate on prepayment meters be 4d. in the shilling, as at present. The Chairman said he thought the shareholders had every reason to be gratified at the result of their year's work. Although the coal account was about £100 more than in the previous year, they had been able to pay their usual dividend—10 per cent.—and to carry over £1000 to help the current year's profits. This was very satisfactory, considering the great advance in the price of coal. They had put in a new bench of retorts, at a cost of £2000. This was being paid entirely out of revenue, as it was a replacement of an old bench. They would be able now to get more gas out of the same quantity of coal than they did with the old retorts. With regard to cooking-stoves, the Directors gave very liberal terms for fitting them into the houses—in fact, practically fitting them free. They also fitted gas-fires free, and their Manager—Mr. W. S. Smith—would be pleased to give advice in cases where supply was deficient or not satisfactory. The report was adopted.

The annual meeting of the Galashiels Gaslight Company was held on Tuesday. The Chairman—Mr. James Dickson—in moving the adoption of the report of the Directors, a summary of which has already been given in these "Notes"—said it was very gratifying to be able to present such a satisfactory report and balance-sheet to the shareholders. The quantity of gas manufactured had been a record one, having exceeded the previous year by nearly 4 million cubic feet. The profit had correspondingly increased, and enabled the Directors to recommend the payment of a dividend of 10 per cent., free of income-tax, and to carry forward about £200 to the reserve fund. The Directors had found it necessary, owing to the very serious rise in the cost of coal, to make an advance of 2½d. per 1000 cubic feet in the price of gas; and it was owing to some contracts having been placed before prices rose so much that they had been able to fix the price of gas so low as 2s. 11d. per 1000 cubic feet. Were the year's supply of coal to be contracted for now, the advance in the price of gas would be considerably more. The low-level siding at the works was completed a few months ago, and was working most satisfactorily. Much of the success of a Company like theirs depended upon those at the head of affairs; and he was certain that they all felt that in Mr. Francis Scott they had one who knew his work thoroughly, and who did it most efficiently He was well supported by Mr. A. Scott, his father, who for many years proved himself a capable and careful Manager of the Company. The report was adopted, and the dividend recommended agreed to.

The Aberdeen Corporation on Monday resolved that the salary of Mr. Charles E. Smith, the Assistant-Manager, should be increased by £25 a year—a similar increase to be made next year.

The Lochgelly Gas Company, Limited, held their twenty-second annual meeting last night. The Directors reported a profit on the year's working, including premium on new shares, of £848. A dividend at the rate of 6 per cent. was declared, and £248 was carried to the current year's account. The price of gas was raised from 3s. 9d. to 4s. 2d. per 1000 cubic feet. The make was 13,399,220 cubic feet—an increase of 3,319,070 cubic feet.

The annual report of the Directors of the Stirling Gaslight Company shows the net profit for the year, after deducting £1000 from revenue to account of the replacement of the retort-bench, to have been £4825. Dividends at the rate of 9s. 5·5134d. upon the capital shares

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of £5 7s. 6d., and on the new ordinary shares at the rate of 11s. per £10 share, are recommended; being at the same rates as were paid last year.

The Dalry, Ayrshire, Gas Company, have raised the price of gas by 5d.; making it 4s. 7d. per 1000 cubic feet.

The Alyth Gas Company have paid a dividend of 6 per cent., after writing off a substantial sum for depreciation. The price of gas has been retained at 5s. 5d. per 1000 cubic feet for lighting purposes, and at 5s. for cooking and motive power.

A fuller statement regarding the Kirkcaldy Gas Company, Limited, shows that the quantity of gas manufactured during the year was 145,600,000 cubic feet—an increase over the previous year of 4,372,000 cubic feet—and that the profit amounted to £4184.

The shareholders of the Kinross and Milnathort Gas Company, at their annual meeting on Wednesday, advanced the price of gas by 2½d.; making it 4s. 4½d. per 1000 cubic feet.

The Motherwell Gas Company held their annual general meeting on Thursday, at which a dividend of 10 per cent. was declared. The shareholders adopted the Memorandum and Articles of Association for the Limited Liability Company which is to be incorporated. At present the capital is £37,500. This is to be increased to £60,000, in £1 shares—the present shareholders to receive a bonus of half-a-share for each share held by them at present.

The Bellshill Gas Company, Limited, held their annual meeting on Thursday. The Chairman—Mr. W. Neilson, J.P.—said it was gratifying to observe that the Company's operations were still extending. The make of gas for the year was 26,943,000 cubic feet—an increase of 2,797,000 feet on the preceding year. They had been obliged to erect a new and extended retort-bench, in consequence of which a considerable sum was spent during the year. A dividend of 5 per cent., free of income-tax, was declared. Owing to the large increase in the cost of coal, the Directors felt themselves obliged to raise the price of gas by 2½d. per 1000 feet; making it 3s. 4d. The report was adopted.

The Anstruther and Cellardyke Gas Company, Limited, held their annual meeting on Wednesday. The profit for the year was reported to have been £942. A dividend at the rate of 5 per cent. was declared, absorbing £250; £368 was added to the depreciation fund; and £324 was carried forward. The quantity of gas consumed during the year was 11,045,000 cubic feet; and the revenue from gas was £2092.

The Coupar Angus Gas Company met on Wednesday, and unanimously adopted recommendations by the Directors as follows: (1) That a dividend of 5 per cent. be declared; (2) that £50 be set apart for repayment of debentures; (3) that there be no alteration in the price of gas meanwhile; and (4) that an honorarium of £10 and an increase of salary be voted to the Manager—Mr. W. F. Vernon—for his services. During the year plant for the manufacture of sulphate of ammonia was put down; and as there is considerable local demand for the product, the venture has proved a great success.

At the annual meeting of the shareholders of the Pittenweem and St. Monance Gas Company, it was reported that the consumption of gas during the year amounted to 6,374,350 cubic feet, the revenue from which was £1328. A dividend of 10 per cent. was declared—the same as last year.

A Select Committee of the House of Commons, presided over by Major Seely, has this week been considering the Renfrewshire Upper District (Eastwood and Mearns) Water Bill, the object of which is to authorize the purchase by the Renfrew County Council of the Busby Water Company, and to extend the existing water-works of the Company. It will be remembered that the Corporation of Glasgow promoted a Bill for the same purpose; but it was thrown out by a Committee of the House of Lords. The Corporation, holding that they are bound, by their Act of 1855, to supply water in the Busby area, carried their opposition to the House of Commons. In the course of the proceedings, Mr. Beveridge, on behalf of the Corporation, made an offer to supply water from their Gorbals water-works, as far as Newton Mearns, at a domestic rate not exceeding 1s. in the pound, and to purchase the Company. The County Council, it had been shown, could not supply water for less than 1s. 6d. in the pound. The offer was not accepted; but after the return of the parties to Glasgow—the inquiry having been adjourned for a week—an agreement was come to upon the lines of the offer. Part of the area is within the county of Lanark, and terms have yet to be come to with the Lanark County Council; but it is believed that this will be easily accomplished. The Corporation of Glasgow are to promote a Bill next year to authorize the arrangement.

The revenue of the Dundee Water Commission for the year ending May 15 amounted to £54,849, of which £17,857 was derived from the domestic rate, £4601 from the public rate, and £32,391 from supplies by meter. There was a surplus of £2825 on the past year's working. During the year, £14,993 was expended in the uplifting and re-laying of portions of the old Lintrathen main, and £10,872 was the cost of taking over the Carnoustie plant. The Commission have reduced the domestic rate from 9d. to 7½d. in the pound, and retained the other charges at the same figures as last year.

Cramped Gas-Works.—At the last meeting of the Hebden Bridge Urban District Council, Mr. T. B. Chambers, in moving the adoption of the report and balance-sheet of the Hebden Bridge and Mytholmroyd Gas Board, said they had had a successful year; but they were hampered at the gas-works, which were about half the size they should be for economical working. They could stock only seven days' supply of coal and one day's supply of gas; and if they had some dark days they would be on their "beam ends." They really should go in for another site. They had doubled their output of gas; and he did not know a place where the same quantity (75 million cubic feet per annum) was made on so small an area. Praise was accorded to the Board and to the Engineer and Manager (Mr. E. J. Wellens) for the way in which they had carried on the works.

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July 6.*

There has been no special feature in the market upon which to comment. Supplies have not been over-abundant, makers having as far as possible cleared out their stocks within the first half of the year; but, on the other hand, demand has rather slackened, so that the opening prices have not been improved upon. The closing quotations remain £11 15s. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. In the forward position, no important first-hand business has transpired; makers being firm in their attitude, while buyers remain indifferent. Further speculative selling is, however, reported from abroad at a discount on makers' prices.

Nitrate of Soda.

This article is steady at 11s. per cwt. for ordinary, and at 11s. 3d. or refined quality, on spot.

Tar Products. LONDON, *July 6.*

The market for tar products is quiet, and there is little business doing, with the exception of creosote, which remains firm. In pitch, the season is now practically over, and there probably will not be any more shipping done until next September. If immediate shipment were guaranteed, one could purchase at 26s. in London to-day; but as this is out of the question, the price is purely nominal. For forward delivery, makers are very firm in their ideas, and will not consider anything under 30s. On the east coast, makers will accept 25s. to 25s. 6d. for prompt delivery; but for forward, 28s. 6d. to 29s. 8d. appears to be about the ruling figure. On the west coast, a reasonable figure would be accepted for prompt delivery, as several makers will have to carry forward a great deal more than they like; and pitch has been freely offered at 24s. without success. For forward, 27s. to 28s. is the price generally quoted. Business on the Continent is still difficult, as consumers refuse to pay the equivalent of figures asked on this side, and their ideas are very slightly in advance of to-day's prompt figures, so that they give dealers no inducement to sell to them. In South Wales, from 30s. 6d. to 31s. has been accepted for water-borne pitch, both to the end of the present year and also over the next twelve months. Creosote is very firm all round, though there is no alteration in prices. London manufacturers quote from 2⅝d. to 3d. per gallon, for both prompt and forward delivery, and do not appear to be anxious to sell, even at this figure, any considerable quantity. In the Midlands, the figures may be taken at 3d. per gallon all round; while in the North, from 2½d. to 2¾d., according to quality and period of delivery. Benzol, 90 per cent., is very quiet, and sales are difficult to make; and to place any quantity one would probably have to discount even the present market to a considerable extent. Toluol is weak, and it is possible to buy at out-ports at 11d. per gallon, and in London at 1s. Benzol, 50-90's, is not in much demand, and even the low prices indicated by makers are no inducement to consumers to purchase. It is evident that they have large stocks, which will enable them to remain out of the market for some little time to come. Solvent naphtha is very quiet, with the exception of London, where the demand is steady and appears to be about equal to the production of actual London makes. Carbolic acid is in about the same position. Continental consumers refuse to offer more than 1s. 7½d., except at certain picked ports which give them an advance of freight. Manufacturers are, however, well sold, and will not consider anything like this price. Creosote salts and naphthalene are both unchanged, being in good demand, at existing figures. No business of importance has taken place for some little time past in anthracene.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 26s. nominal; east coast, 25s. to 25s. 6d.; west coast, 23s. 9d. to 24s. 3d. Benzol, 90 per cent., 7½d. to 8¼d.; 50-90 per cent., 8¼d. to 9¼d. Toluol, 11d. to 1s. Crude naphtha, 4d. to 4½d.; solvent naphtha, 1s. to 1s. 2½d.; heavy naphtha, 1s. 2d. to 1s. 3d. Creosote, London, 2⅞d.; North, 2½d. to 2⅝d. Heavy oils, 3d. to 3⅛d. Carbolic acid, 60 per cent., 1s. 7½d. to 1s. 8d. Naphthalene, £6 10s. to £12 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market is steady, but without much interest. Dealers appear to be willing to buy at about existing figures for prompt delivery; but up to the present they will not pay the prices asked for forward. The principal London Gas Companies do not care to quote for this year's delivery, being fairly well sold; while for next year they quote £12 5s. Ordinary stuff, however, can be secured on Beckton terms at about £11 13s. 9d. to £11 15s. per ton. In Leith, the demand is still fairly good; and the figures remain at about £12 to £12 2s. 6d. In Liverpool, some good grey was offered at £11 18s. 9d.; and this may be taken as about the ruling price. In Hull, the market is quiet, with not much business. About £11 15s. may be taken as the ruling figure.

Loughborough Gas Supply.—At the meeting of the Loughborough Town Council on Monday week, Alderman Bumpus, in moving the adoption of the Gas Committee's minutes, said the balance-sheet for the past financial year showed a gross profit on the revenue account of £6923.

Another Loan for the Devonport Gas-Works.—Mr. J. Buckley, the Gas Engineer and Manager of the Devonport Corporation, reported to the Gas Committee last Thursday that the capital of £35,000 raised for the purchase of gas stoves, meters, and automatic installations had been expended. He said the progress of the undertaking in this direction continued; and he recommended that application should be made to the Local Government Board for sanction to borrow a further sum of £25,000, which he estimated would cover the outlay in the next three years. The Committee decided to recommend the Council to take the necessary steps to raise the loan.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

Trade is being kept up at a high level. Weather influences are all in favour of the coalowner; and the result has been a continuance of orders for house coal. Engine fuel is in strong demand. A steady business is being done in shipping coal. There is no change to record in prices. Exports of coal from the Ship Canal and from other English ports continue to increase; the returns for the six months ending May showing a large tonnage over the exports during the corresponding period of last year.

Northern Coal Trade.

There is a little more irregularity in the northern coal trade; the output at the collieries being now fuller. With, however, a better supply of steamers to take cargo, there seems to be some ease in the home demand; but deliveries on the contracts for export are heavy. Best Northumbrian steams are steady at about 14s. 7½d. to 14s. 9d. per ton f.o.b., second-class steams are 14s. to 14s. 3d., and steam smalls are firm at 10s. to 10s. 3d. Some additional contracts for Sweden have been booked at prices near those quoted. In the gas coal trade there is a good demand, though this is the dullest period of the year in the home trade—the exports being heavy. Durham gas coals for prompt or early shipment vary from about 13s. 3d. to 14s. 6d. per ton f.o.b., according to quality, with a few pence higher quotation for one or two special classes. As to contracts, no very heavy ones have been fixed in the last few days; but in all cases higher prices are claimed. For Barletta, a contract for some 30,000 tons for next year has been closed; and though the price is not officially stated, it is said to be from 13s. 6d. to 13s. 9d. per ton f.o.b. Others may reach somewhat similar figures. The coke market is firm; and good gas coke for export seems somewhat scarce. The quotation is about 17s. per ton f.o.b. Gas coke is being offered for household use at 16s. per ton, unbroken, but delivered.

Scotch Coal Trade.

There is great activity in the coal market, the approaching holidays leading to a rush to obtain supplies. There is said to be little coal available for delivery before the holidays; and until they are over, there is no probability of prices slackening. The quotations are: Ell 12s. 6d. to 13s. 9d. per ton f.o.b. Glasgow, splint 13s. to 13s. 3d., and steam 12s. 6d. to 12s. 9d. The shipments for the week amounted to 348,387 tons—an increase of 36,785 tons upon the previous week, and of 30,909 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 7,050,280 tons—an increase of 395,348 tons upon the corresponding period of 1906.

Directors' Fees as Profits.

Upon the above subject, the "Law Journal" makes the following remarks: "Directors have had such a bad time of it in Courts of Equity under the doctrine of fiduciary relationship, that the decision of Justice Warrington in the matter of the Dover Coalfields Extension, Limited, will come as an agreeable surprise. The Dover Company had a large holding in the Kent Collieries Corporation, and, to protect its interests, it wanted to be represented on the Board of the Corporation. Accordingly, the Company transferred certain of its shares in the Corporation to two of its Directors, A and B, to qualify them for a seat on the Board of the Corporation. They were elected and acted as Directors; and, for so acting, they received, in Directors' fees, £800 or £900 apiece. Then the Dover Company was wound up, and the Liquidator said to A and B: 'Hand over that £800 to me; it was a profit which you made by use of the Dover Company's property—*i.e.*, its shares which qualified you—and you must account for such profit to the Company.' Instinctively, we feel that there is a fallacy here; and Mr. Justice Warrington quickly put his finger upon it. The Director's right to remuneration in such a case does not arise from the possession of his qualification shares, but by reason of the contract of service. Such remuneration is not profit at all, in the same sense as dividends or bonuses on the shares are profit; it is payment for work. It would be monstrous if Directors were to do all the work of management, and then the Company were to take from them the fees which they had fairly earned. Companies cannot let out their Directors for hire."

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold, under instructions from executors, shares and stocks of several prominent Gas Companies. Parcels of "A" and "C" 10 per cent. stocks of the Barnet District Gas and Water Company, carrying 7½ per cent. dividend, sold at £167 per £100 of stock; "B" 10 per cent. stock of the same Company, on which 6⅔ per cent. has been paid for the past few years, fetched £145 per £100 of stock; "D" gas and water stocks (7 per cent.), carrying 5¼ per cent., realized £121 10s. for the former and £120 to £121 10s. for the latter per £100. Ordinary "C" stock of the Ilford Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, fetched £124 to £125 10s. per £100, *cum div.* at the rate of 6 per cent. per annum. Some "A" stock of the Tottenham and Edmonton Gas Company (standard dividend 5 per cent., but carrying 1½ per cent. more) was sold at £131 to £132 10s.; and some "B" stock (standard dividend 3½ per cent.), at £103 10s. to £107 per £100, *cum div.* at the rate of 5 per cent. A few £10 "B" shares (7 per cent.) in the Sevenoaks Gas Company fetched £15 5s. each. Some consolidated ordinary stock of the West Ham Gas Company, carrying 5½ per cent. dividend, was sold at £108 per £100; and some similar stock of the Reading Gas Company, carrying 5 per cent. dividend, at £106. A few new £10 shares in the Worthing Gas Company (7 per cent.) fetched £14 12s. 6d. per share; and some consolidated stock (10 per cent.), £200 per £100. The last lots consisted of a few "A" original £5 shares in the St. Margaret's Gas Company, Limited, on which 6 per cent. dividend has been paid for two years; and they fetched £6 5s. per share. At a recent sale by Messrs. Dann and Lucas, a new issue of £10 shares (7 per cent.) in the Dartford Gas Company was placed at £13 10s. to £13 17s. 6d. per share.

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Ilkeston Corporation Gas Department.

We learn from the Gas Engineer and Manager of the Ilkeston Corporation (Mr. F. C. Humphrys) that the gas made in the year ending the 31st of March last was 103,716,400 cubic feet—an increase of 4,130,700 cubic feet on the make in the preceding year; and the resulting ncome has advanced from £11,678 to £12,304. The return for residuals (chiefly coke) is better, being £4057, against £3933; making a total increase of about £700. The cost of manufacture, owing mainly to the greater tonnage of coal used, advanced from £7153 to £7316. Distribution expenses returned to the normal, and stand at £887. Nearly £200 was added to the account for the repair and replacement of cookers; and with rates and taxes and management at the usual figure, there was a total expenditure of £10,179, against £10,040 in the year 1905-6; leaving a gross balance of £6368, compared with £6168 before. This balance will permit of the necessary larger allowances for depreciation and sinking fund charges, and (with the addition of £143 from the suspense account) provide for the ordinary contribution to the rates. The number of consumers is 4778, of whom 3614 have prepayment meters; being an augmentation to the extent of 340. There are 1623 cookers in use—an increase of 153. The number of orders received at the office from customers exceeded 3700, most of which were dealt with the day they were received. All the works, plant, and mains were renewed where necessary, and generally maintained out of revenue; and Mr. Humphrys says that, considering their limited capacity, they are fairly efficient. The general question of increasing their capacity is being considered by the Gas Committee.

Loans for Ferro-Concrete Constructions.

In the House of Commons, on Monday last week, Mr. Whitehead asked the President of the Local Government Board whether the adoption by local authorities of the method of construction known as ferro-concrete was discouraged by the Board, and whether they required a much shorter period than the normal one for repayment of loans if this method was adopted; whether he was aware that ferro-concrete had been proved, both on the Continent and in the United States, after many years' experience, to be durable and fire-resisting, and that it was about to be used in the construction of the new General Post Office; and whether, having regard to the importance of this question, both to local authorities and those interested in the manufacture of cement, he could see his way to treating loans for purposes involving this method of construction on at least as favourable a footing as those for construction with bricks and mortar. Mr. Burns, in reply, said he was advised that it was doubtful whether ferro-concrete was a suitable material for permanent structural works under all conditions, and consequently there was need for caution in dealing with it. The Local Government Board had had under their notice examples of the failure of works constructed with it. He believed it was intended to use this material in the construction of the new General Post Office; and it was the case that it had been employed for some years on the Continent and in the United States. Its use had not, however, always been successful. He was not at present satisfied that the periods allowed for the repayment of loans for works constructed of ferro-concrete could be properly extended.

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No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS MANAGER. No. 4791.
BUSINESS AND SALES MANAGER. "Z. G." 200, c/o Deacon's.
CHIEF ASSISTANT-ENGINEER. Leeds Water Department. Applications by July 19.
FOREMAN GAS-FITTER. Brighouse Gas Department. Applications by July 20.
ASSISTANT-MANAGER, GAS AND WATER. Borough of Barrow-in-Furness. Applications by July 17, 1907.

Situations Wanted.

SULPHATE OF AMMONIA LEAD WORK. Bond, Warwick Road, Kensington.
GAS-STOVE SHOW-ROOM. King, 55, Ranelagh Road, Pimlico.
REPRESENTATIVE, GAS LIGHTING FIRM. No. 4795.

Plant (Second-Hand), &c., for Sale.

ENGINE AND EXHAUSTER, &c. Riddings Gas Company.
ENGINE AND EXHAUSTER, METERS, &c. Widnes Gas Department.
PURIFIERS, &c. Galston Gas-Works.
STATION METER. Whittington Gas-Works.
STATION METER, ENGINE AND EXHAUSTER, PURIFIERS, SCRUBBERS, WASHERS, ENGINES AND BOILERS, AND OTHER GAS WORKS PLANT. Hastings Gas Company.

Plant (Second-Hand) Wanted.

SCRUBBERS AND WASHERS. "Gas-Works," c/o Vickers.

Gas-Works, &c., for Disposal.

KENT COUNTY GASLIGHT AND COKE COMPANY (in Liquidation).

Stocks and Shares.

UXBRIDGE GAS COMPANY. July 17.

TENDERS FOR

Coal and Cannel.
HAYLING ISLAND GAS COMPANY. Tenders by July 16.
MALTON GAS COMPANY. Tenders by July 20.

Concrete (Reinforced) Floors.
COVENTRY GAS DEPARTMENT. Tenders by July 10.

Oil for Gas Making.
LEEDS GAS DEPARTMENT. Tenders by July 20.

Tar and Liquor.
COVENTRY GAS DEPARTMENT. Tenders by July 10.
MATLOCK GAS COMPANY. Tenders by July 15.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
268,324	10	,,	7½	Do. 7 p.c.	13¾—14¼	..	5 3 5
200,000	5	May 15	7	Bombay, Ltd. . . .	6¾—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
50,000	10	Feb. 28	14	Bourne-mouth Gas & Water } B 7 p.c.	27⅞—28½	..	4 18 3
51,810	10	,,	7	Pref. 6 p.c.	16¼—17	..	4 2 4
53,200	10	,,	6		15—16	..	3 15 0
380,000	St'k.	,,	12½	Brentford Consolidated	250—255	+3	4 18 1
300,000	,,	,,	9½	Do. New . . .	188—193	..	4 18 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	117—122	..	4 2 0
206,250	,,	June 13§	4	Do. 4 p.c. Deb. .	100—103	..	3 17 8
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk. .	160—165	..	5 0 0
460,000	20	Apl. 11	10	British	41—43	..	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c. .	119—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	May 15	7	Buenos Ayres (New) Ltd.	11—11¼	..	6 1 9
250,000	Stk.	June 27	4	Do. 4 p.c. Deb. .	93—95*	..	4 4 3
150,000	20	Mch. 14	8½	Cagliari, Ltd.	25—27	..	5 17 10
100,000	10	June 13	10	Cape Town & Dis., Ltd.	11—13	..	7 13 10
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref. .	8¾—9½	..	4 14 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96*	..	4 13 9
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,443,280	Stk.	,,	5⅛	Commercial 4 p.c Stk. .	105—108	..	4 16 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	102—105	..	4 15 3
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	112—117	..	5 11 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
486,090	10	Jan. 31	12†	European, Ltd. . . .	23—24	..	5 0 0
354,060	10	,,	12†	Do. £7 10s. paid	18—19	+½	4 14 9
15,203,110	Stk.	Feb. 14	4⅘	Gas-light & Coke } 4 p.c. Ord. . .	94—96	+1	4 11 7
2,600,000	,,	,,	3½	3½ p.c. max. . .	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	102—105	..	3 16 2
4,193,975	,,	June 13	3	3 p.c. Con. Deb.	82—84	..	3 11 5
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95—100	..	5 0 0
82,500	,,	,,	6½	Do. do. 5 p.c.	116—119	..	5 9 3
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	15—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental .	171—174	+1	4 12 0
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Mch. 14	6	Lea Bridge Ord. 5 p.c. .	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110*	..	3 12 9

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 28	10	Liverpool United A . .	221—223	..	4 9 8
718,100	,,	,,	7	Do. B. .	164—165	+½	4 4 10
144,140	Stk.	Feb. 14	7⅜	Maidstone 5 p.c. . .	142—147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd. .	4—4½*	..	5 11 1
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb..	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 30	3½	Monte Video, Ltd. . .	10¾—11¼	..	6 1 9
1,775,892	Stk.	Feb. 28	4⅝	Newc'tle & G'tesh'd Con.	107—109	+1	4 4 10
406,025	Stk.	June 27	3½	Do. 3½ p.c. Deb.	94—95*	..	3 13 8
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Apl. 26	8	Oriental, Ltd. . . .	140—145	−3	5 10 4
60,000	5	Mch. 27	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	May 15	7	Primitiva Ord. . . .	6¾—7¼	..	4 16 7
796,980	5	Jan. 31	5	Do. 5 p.c. Pref. .	5—5¼	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	+1	4 3 4
1,000,000	10	Apl. 26	8	River Plate Ord. . . .	12¾—13¼	..	6 0 9
312,650	Stk.	June 27	4	Do. 4 p.c. Deb. .	93—95*	..	4 4 3
250,000	10	Mch. 27	8	San Paulo, Ltd. . . .	12½—13	..	6 3 1
125,000	50	July 1	5	Do. 5 p.c. Deb. .	48—50*	..	5 0 0
135,000	Stk.	Mch. 14	10	Sheffield A	245—247	..	4 1 0
209,984	,,	,,	10	Do. B	245—247	..	4 1 0
523,500	,,	,,	10	Do. C	245—247	..	4 1 0
70,000	10	June 13	10	South African	15—16	..	6 5 0
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	119—121	+1½	4 10 11
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	82—84	−1	3 11 5
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	157—159	..	5 0 8
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	117—121	..	4 10 11
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 10 11
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	May 15	5	Southampton Ord. . .	105—110	..	4 10 11
120,000	Stk.	Feb. 28	6½	Tottenham } A 5 p.c. .	123—126	..	5 3 2
398,940	,,	,,	5	and } B 3½ p.c. .	100—103	..	4 17 1
137,500	,,	June 27	4	Edmonton } 4 p.c. Deb.	99—101*	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10½—10¾	..	7 8 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102*	..	4 13 0
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Feb. 14	8	Wands-worth } A 5 p.c. .	—	..	—
255,636	,,	,,	6½	B 3½ p.c. .	131—136	..	4 15 7
75,000	,,	,,	5§	and } C 3½ p.c. .	—	..	—
79,416	,,	June 27	3	Putney } 3 p.c. Deb. Stk.	77—80*	..	3 15 0
845,872	,,	Feb. 28	5½	West Ham 5 p.c. Ord. .	102—105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 1 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	100—103*	..	3 17 8

Prices marked * are "Ex div." † Next dividend will be at this rate.

Public Lighting of Calcutta.—Tenders are being invited for lighting by gas, oil, electricity, or other illuminant, the streets, thoroughfares, &c., of Calcutta. The city comprises approximately an area of 20 square miles, containing about 170 miles of main thoroughfares and 130 miles of smaller streets, besides several squares, markets, latrines, slaughter-houses, &c., which are now lighted by gas and oil lamps. The city is supplied with gas by the Oriental Gas Company.

Increased Gas Consumption in Belfast in June.—The unsettled weather which has lately prevailed, while causing much lamentation on the part of certain classes of traders, was a source of profit to the Belfast Corporation. According to a statement made by Mr. Doran when moving the adoption of the minutes of the Gas Committee at the last meeting of the Corporation, there was an increase to the extent of 10 million cubic feet in the output of gas last month in comparison with the corresponding period of the past year.

The Proposed Purchase of the Crewkerne Water-Works by the District Council.—The question of the purchase of the water-works was again considered by the Crewkerne Urban District Council last Tuesday. The Directors of the Water Company wrote that they could not advise the shareholders to accept the offer made by the Council; their opinion being that the price they had themselves fixed was not more than a fair and reasonable one for the undertaking. They added that they were prepared, up to the 8th of August, to adhere to the terms of their letter to the Council; but after that date they reserved to themselves the right to make such alterations as they might deem advisable. It was pointed out that the difference was between £14,500 offered by the Council and £16,500 and costs required by the Company. It was suggested that if the Company failed to come to terms, the Council would be justified in obtaining a supply of their own. After considerable discussion, it was decided that the Clerk should again write to the Company, suggesting that facilities should be granted for an inspection of the whole water system, machinery, and plant by a competent engineer to be appointed by the Council before they proceeded further with the negotiations.

Messrs. Arden Hill and Co. have just completed installations of "Acme" and slot cookers for the Hirwain Gas and Coke Consumers' Company, Limited, Glamorganshire.

Lord Rosebery on Friday afternoon inaugurated a water service which he has constructed and presented to the village of Cheddington (Bucks.), at an approximate cost of £2000, as a memorial of the late Lady Rosebery.

We have received from Messrs. C. & W. Walker, Limited, a neatly printed pamphlet illustrating examples of the structural steel and cast-iron work they have carrried out. They comprise steel buildings, chimneys, gasholders, oil or tar tanks, and riveted tubes and mains.

We learn from our local correspondent that the passing of the Worthing Gas Bill by the House of Lords was the occasion of great enthusiasm at Goring, where the new works are to be erected. A workmen's procession marched round the village; and there was a large amount of bell-ringing and cheering.

Ever on the alert to extend the use of gas, Mr. R. S. Ramsden, the Assistant Gas Manager to the Burton-upon-Trent Corporation, has issued a neat booklet showing at a glance the prices now in vogue in the borough for gas used for motive power and other manufacturing purposes. They range from 2s. down to 1s. 6d. per 1000 cubic feet, according to quantity.

At a meeting of the Council of the Secret Commissions and Bribery Prevention League last Tuesday, at the London Chamber of Commerce, Sir Edward Fry was chosen as the first President, and the Archbishop of Canterbury, Earl Fortescue, Lord Avebury, Sir W. H. Holland, Sir W. Mather, and Mr. David Howard were elected Vice-Presidents. Mr. David Howard, who presided, reported that the League had made considerable progress, and was obtaining an increasingly influential membership. Mr. R. M. Leonard has recently been appointed Secretary; and the offices of the League have been removed to No. 3, Oxford Court, Cannon Street, E.C.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

J. & J. BRADDOCK (Branch of Meters
Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

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SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
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CHARLES E. FRY, LEAMINGTON,
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BENZOL
AND
CARBURINE FOR GAS ENRICHING.

ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim Street Chambers, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS

BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

GAS PLANT for Sale—I can always offer
NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 7, Park Square, LEEDS.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS TAR wanted.
Brotherton and Co., Ltd., Tar Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers.
Works: Birmingham, Leeds, Wakefield, and Sunderland.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market,
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

INCREASE YOUR MAKE.
SEND for Particulars of the "RAPID" Carburettor. Why be short of Gas when you can stretch the make from 1000 to 2000 cubic feet per ton, without any difficulty?
Biggs, Wall, & Co., 13, Cross Street, Finsbury Pavement, London.

TEMPERLEY TRANSPORTERS
FOR Rapid and Economical Handling of Coal and Coke in Gas-Works.
Next Illustrated advt. will appear on July 16.
TEMPERLEY TRANSPORTER COMPANY,
72, Bishopsgate Street Within, London, E.C.
Telephone: 365 London Wall. Telegrams: "Transumo."

STEAM (all Types, all Sizes) Boilers. Vertical, Loco., Cornish, Launch, Field-tube; also AIR RECEIVERS, FEED-WATER HEATERS, CYLINDERS, &c.
Grantham Boiler & Crane Co., Ltd., Grantham.

SULPHATE of Ammonia Lead Work, Labour only, done on reasonable terms by a good quick LEAD BURNER, own Tools, Machine, &c. Work Guaranteed.
Address John Bond, 124, Warwick Road, Kensington.

BANBURY GAS COMPANY.
THE Directors having received 190 Applications in reply to their advertisement for MANAGER, beg to THANK all those Gentlemen who applied, and to say that as it is impossible to reply to the whole of them, any one who has NOT BEEN COMMUNICATED WITH will kindly understand that HIS APPLICATION IS NOT ACCEPTED.
W. R. Cooper,
Secretary.
Banbury, July 4, 1907.

GENTLEMAN with large Experience in Gas Lighting requires Position as REPRESENTATIVE in London or Provinces. First-Class References. Salary and Commission.
Address, No. 4795, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

D. H. KING, 5½ Years with the Davis Gas Stove Company in London Show-Rooms and London District, seeks similar Position with Gas-Stove Firm or Gas Company. Thorough knowledge of Stoves, Fittings, &c. Ten Years in the Trade.
Address 55, Ranelagh Road, Pimlico, London, S.W.

WANTED, a Gas Manager for a Gas Company (making about 20 Million Cubic feet) in the Midlands.
Apply, by letter, stating Age, and Salary required, to No. 4794, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BOROUGH OF BRIGHOUSE.
THE Gas Committee of the Corporation require the services of a First-Class FOREMAN GAS-FITTER, able to repair Gas-Meters, and Experienced in Compo., Fires, Cookers, Slot Installations, Private House Fitting, Incandescent Lighting, &c. The Wages will be 35s. per week; but no allowance will be made for overtime.
Applications, to be made on form which can be obtained from the Gas Manager, Mill Lane Works, Brighouse, and to be accompanied by not more than Three *copies* of recent Testimonials.
Applications to be delivered to me, the undersigned, on or before Saturday, July 20, 1907, endorsed "Gas-Fitter."
By order,
James Parkinson,
Town Clerk.
Municipal Offices,
Brighouse, July 5, 1907.

GENERAL Business and Sales Manager required by Important English Gas Company. Applicant must be thoroughly Competent, Energetic, of good Address, and able to Undertake Large Responsibility. Technical knowledge less essential than Commercial Ability. Good Salary.
Address letters to "Z. G.," 200, Messrs. Deacon's, 154, Leadenhall Street, E.C.

BOROUGH OF BARROW-IN-FURNESS.
THE Corporation invite Applications for the Appointment of ASSISTANT-MANAGER of the Gas and Water Works. Salary, £130 per Annum.
Applicants must be competent Draughtsmen, and have a thorough knowledge of Gas Making and Main and Service Laying.
Applications, in own hand-writing, stating Age, Experience, present and previous occupation, and accompanied by *copies* of not more than Three recent Testimonials, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Assistant-Manager," and delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 17th of July, 1907.
Canvassing members of the Council will be a disqualification.
By order,
C. F. Preston,
Town Clerk.
Town Hall, Barrow-in-Furness.

CITY OF LEEDS.
(Water-Works Department.)
APPOINTMENT OF CHIEF ASSISTANT-ENGINEER.
THE Water-Works Committee invite Applications for the Appointment of CHIEF ASSISTANT-ENGINEER in the Water-Works Department.
The Salary will commence at £200 per Annum.
Applicants must be duly qualified Engineers, not more than 35 Years of Age, and must have had Experience in the working of large Towns, together with waste prevention and Distribution.
Applications, Stating Age, Qualifications, and Experience, accompanied by *copies* of not less than Three Testimonials (which will not be returned), and endorsed "Assistant-Engineer," are to be sent to the Town Clerk, and must be delivered not later than Friday the 19th of July, at Ten a.m.
Canvassing directly or indirectly will be considered a Disqualification.
Charles G. Henzell,
Water-Works Engineer.
Municipal Buildings, Leeds.
July 3, 1907.

WANTED, Good, Sound, Second-Hand SCRUBBERS and WASHERS, Cast-Iron preferred, both capable of dealing with 50,000 to 100,000 feet daily.
Address "Gas-Works," care of J. W. Vickers and Co., 5, Nicholas Lane, E.C.

FOR SALE, Three Purifiers—Two of them 10 ft. by 6 ft. by 3 ft. 6 in. and One 9 ft. by 9 ft. by 3 ft. 6 in., with all Connections, in good working order.
Apply to Robert Muir, Manager, Gas-Works, Galston.

EXCEPTIONAL Bargain. 50 feet Double-Lift GASHOLDER, 60,000 feet capacity. Must be cleared by June. Splendid Bargain. Equal to new. Sacrificed and Re-erected at Nominal Sum for Immediate Sale.
Apply to Firth Blakeley Company, Thornhill, Dewsbury.

FOR SALE—A Station Meter, in very good Condition. Was thoroughly Overhauled and Repaired by the Makers Five years ago. Capable of passing 4000 feet per hour. Six-inch Valves and Connections with Cradle complete.
Apply to the Manager, Gas-Works, Old Whittington, near Chesterfield.

THE Widnes Corporation Gas Depart ment have FOR SALE the following:—
40,000 cubic feet per hour Combined STEAM-ENGINE and EXHAUSTER (Donkin).
200 2-Light Wet Ordinary METERS, in Cast-Iron Cases.
300 2-Light Wet Slot METERS, in cast-Iron Cases (by Braddock, Orme, and Alder and Mackay).
The Plant and Meters, which are in excellent condition, may be inspected, and any further Particulars obtained, on application to the Manager, Gas-Works, Widnes.

THE Hastings and St. Leonards Gas Company have FOR SALE, consequent upon the removal of the Carbonizing Plant to the new Glyne Gap Works, near Bexhill, the following:
30,000 cubic feet per hour STATION METER.
50,000 cubic feet per hour ENGINE AND EXHAUSTER.
30 feet square and 20 feet square PURIFIERS, with Lifting Gear.
SCRUBBERS and WASHERS.
ENGINES and BOILERS.
HYDRAULIC MAINS, Patent MOUTHPIECES and ASCENSION PIPES, &c.
Retort-House ROOFS, and a variety of other GAS-WORKS PLANT.
Also about 3 acres of VALUABLE FREEHOLD BUILDING LAND in the centre of the Town of Hastings.
For Particulars and to view apply to Chas. E. Botley, M.Inst.C.E., Engineer and General Manager, Gas Company's Offices, Queen's Road, Hastings.

FOR SALE—A Combined Horizontal STEAM-ENGINE and EXHAUSTER, with Inlet and Outlet Wheel Valves, Foundation Stones, Lubricators, &c. Maker, Bryan Donkin. Capacity, 10,000 cubic feet per hour. Excellent Condition. Removing to make room for larger Exhauster.
Apply to the Riddings District Gas Company, Pye Bridge, near Alfreton.

TENDERS FOR COAL.
THE Directors of the Malton Gas Com- pany invite TENDERS for the Supply of 4000 to 5000 Tons of GAS COAL or NUTS, to be delivered at the Coal Depôts of the North-Eastern Railway, Malton, in the Year ending the 30th of June, 1908.
Forms of Tender and further Particulars may be obtained on Application.
Tenders to be sent to the undersigned on or before the 20th of July inst.
Henry Tobey,
Secretary.

LEEDS CORPORATION GAS-WORKS.
THE Gas Committee are prepared to receive TENDERS for the Supply of 2000 Tons of GAS OIL for the Manufacture of Carburetted Water Gas, for a period of One Year, commencing on the 1st of September next.
Specification and Conditions of Tender may be obtained on Application to the undersigned.
Tenders, addressed to the Town Clerk, and endorsed "Gas Oil," must be delivered at the Town Hall, Leeds, on or before Saturday, the 20th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. Townsley,
General Manager.
Gas Offices, East Parade,
Leeds, July 6, 1907.

HAYLING ISLAND GAS COMPANY.
TENDERS FOR GAS COAL.
THE Directors of the above Company are prepared to receive TENDERS for the Supply and Delivery to the South Hayling Railway Station of 400 Tons (more or less) of Best GAS COALS, as required, during a period of Twelve Months commencing from July 21, 1907. Parties tendering to state name of Pits from where Coal is raised and also yield per ton.
Tenders to the undersigned not later than the first post on Tuesday, July 16, 1907.
The Directors do not bind themselves to accept the lowest or any Tender.
Geo. F. Preston,
Secretary.
7, Hampshire Terrace,
Portsmouth.

REINFORCED CONCRETE FLOORS.
THE Gas Committee of the Coventry Corporation invite TENDERS for the Supply and Construction, at their Foleshill Works, of REINFORCED CONCRETE FLOORS for Retort-House, &c., having approximate floor area of 2450 super. yards.
Form of Tender, with Specification, General Conditions, and Prints of Drawings, will be supplied on application to the undersigned, and on payment of One Guinea, which will be returned on receipt of a *bond-fide* Tender.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Reinforced Concrete Floors," to be addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and delivered on or before Nine a.m. on Wednesday, the 10th day of July, 1907.
Fletcher W. Stevenson,
Engineer and General Manager.
Gas-Works, Coventry,
June 24, 1907.

TENDERS FOR TAR.
THE Gas Committee of the Coventry Corporation invite TENDERS for the Purchase of the Surplus COAL TAR and OIL RESIDUUM produced at their Gas-Works during the Twelve Months commencing Aug. 1 next.
The quantity of Coal Tar will be about 4000 Tons, and will be loaded into the Contractor's Tank-Waggons at the Railway Wharf, Coundon Road, or Canal Tank Barges, Coventry Wharf.
The quantity of Oil Residuum will be about 170 Tons, and will be loaded into the Contractor's Tank-Waggons at the Gas-Works Sidings, Foleshill.
Forms of Tender and Contract to be entered into will be Supplied on Application to the undersigned.
The Committee do not bind themselves to accept the highest or any Tender.
Sealed Tenders, endorsed "Tender for Tar," to be addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and delivered on or before Nine a.m. on Wednesday, the 10th day of July, 1907.
Fletcher W. Stevenson,
Engineer and General Manager.
Gas-Works, Coventry,
June 24, 1907.

IN THE HIGH COURT OF JUSTICE.
Companies (Winding Up.) No. 00416 of 1906.
IN THE MATTER OF THE KENT COUNTY GAS-LIGHT AND COKE COMPANY, LIMITED.
(In Liquidation.)
THE Freehold Gas-Works of the above- named Company, situated at Goudhurst, in the County of Kent, including Buildings, Plant, Purifiers, Mains, Services, Meters, &c., the Goodwill of the Business, and the benefit of all Contracts, are to be SOLD by the Liquidator.
Intending purchasers may obtain Particulars of past trading and permission to view the premises on making Application to the Official Receiver in Companies' Liquidation, Board of Trade, 33, Carey Street, Lincoln's Inn, London, W.C., to whom Offers to Purchase the property should be submitted.